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CANADIAN CHEMISTRY AND METALLURGY

Vol. VII., No. 1 TORONTO, JANUARY, 1923 $3.00 a year

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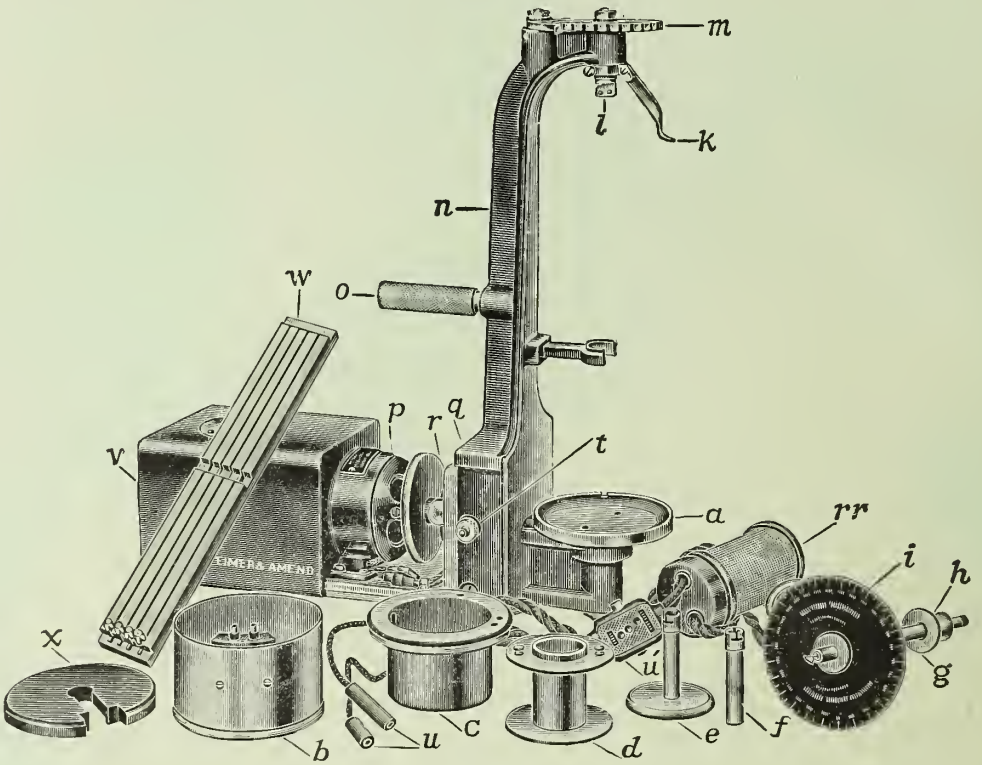

FOR a long time the need of a satisfactory viscosimeter has been apparent to expert chemists. The ordinary instruments, while useful, and in some cases indispensable for special tests, are in general not adapted to give quickly and accurately the viscosity of all viscous material in recognized scientific units. Viscosity, especially in the case of organic products, is usually bound up closely with the desirable quality of the material; so that, in a large proportion of cases, the position of the material on the viscosity scale is an indication of its position on the scale of desirability.

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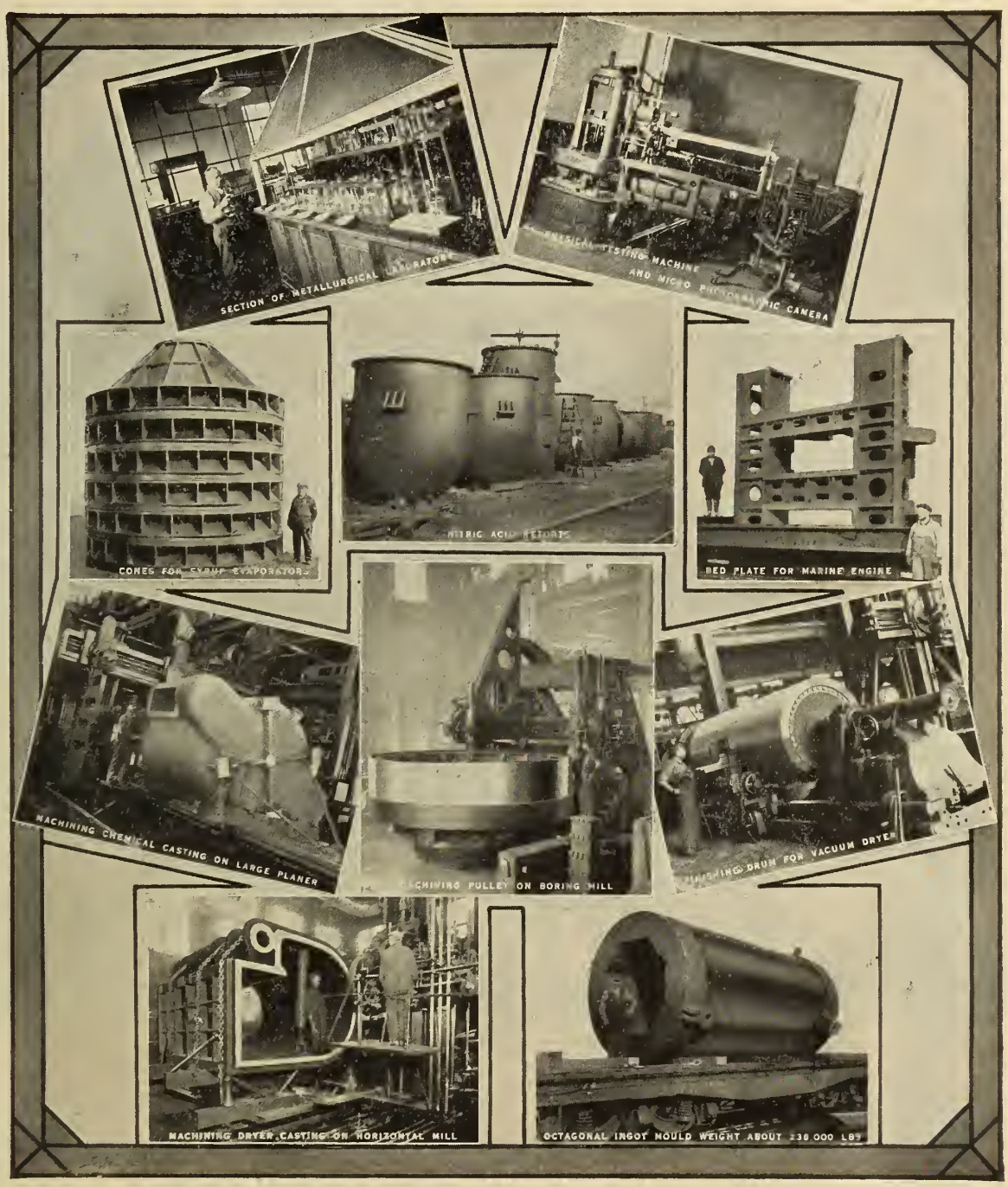
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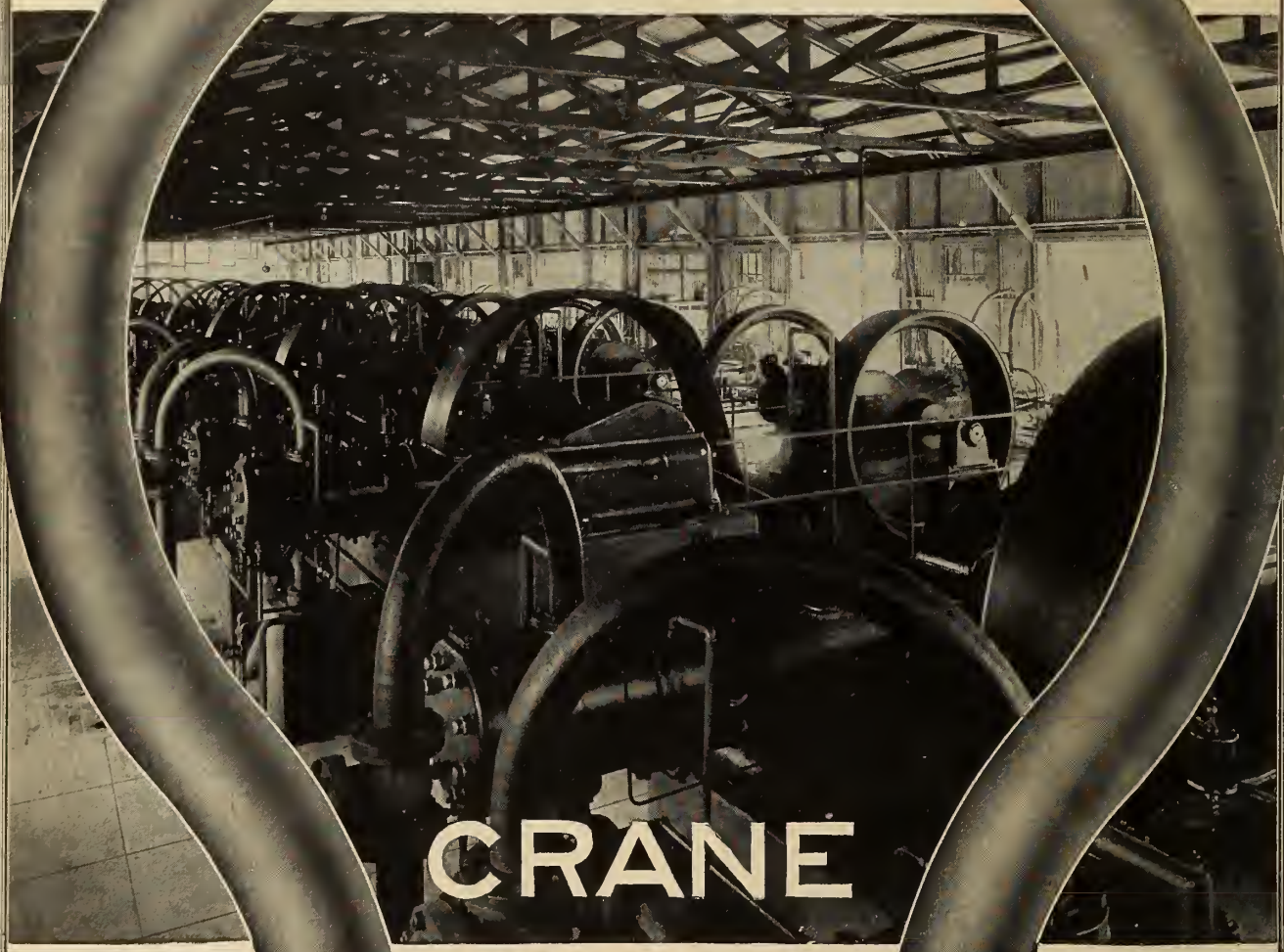

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13a

ONTARIO'S MINERALS

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

Hon. H. Mills, Minister

The following table, subject to revision, summarizes the mineral production of Ontario for 1921. As far as possible the figures represent quantities shipped and values received for marketed products. Tons throughout are short tons of 2,000 pounds. Final figures for 1920 are included for comparison.

Summary of Mineral Statistics, 1921

	Quantity		Value	
Metallic	1920	1921	1920	1921
Gold ..... ounces	565,283	709,509	$11,686,043	$14,624,085
Silver ..... "	11,065,415	8,412,059	10,873,496	5,497,160
Platinum metals ..... "	19,056	(a) 915	1,996,535	51,060
Copper ..... lbs.	6,825,772	3,070,719	1,041,994	356,708
Nickel, metallic ..... "	11,015,692	5,430,147	3,852,141	1,825,359
Nickel, oxide ..... "	4,890,571	1,402,019	1,151,490	285,391
Cobalt, metallic ..... "	167,750	32,718	392,926	98,228
Cobalt, oxide ..... "	569,182	155,554	1,210,810	354,418
Other Nickel and Cobalt compounds ..... "	161,442	108,814	16,991	114,069
Lead, pig ..... "	2,232,253	3,570,222	179,714	190,843
Copper in matte exported (b) ..... tons.	11,715	3,686	2,928,750	737,142
Nickel in matte exported (b) ..... "	21,371	4,850	10,685,500	1,939,851
Iron ore and briquettes (c) ..... "	68,616	100	60,958	459
Iron, pig (d) ..... "	67,164	82,318	2,204,205	2,079,729
Total metallic			$48,281,553	$27,574,202
Non-Metallic				
Actinolite ..... tons.	100	78	$ 1,160	$ 975
Arsenic, crude and white ..... lbs.	3,781,389	2,982,525	432,434	233,763
Clay products—				
Brick, common ..... M.	123,551	99,463	2,209,265	1,743,094
Brick, fancy and pressed ..... "	32,559	31,481	809,126	673,087
Tile, drain ..... "	9,784	9,910	359,373	250,040
Tile, roofing and building ..... tons.	58,737	.....	369,530	211,529
Pottery	.....	.....	127,049	67,985
Sewer pipe	.....	.....	860,811	939,464
Cement, Portland ..... bbls.	2,035,594	2,723,072	4,377,814	6,425,266
Corundum ..... tons.	196	402	27,000	50,250
Feldspar ..... "	37,335	15,506	268,295	114,059
Fluorspar ..... "	3,704	115	67,381	1,744
Graphite, crude and refined ..... "	1,956	363	132,882	23,273
Gypsum, crushed, ground and calcined ..... "	74,707	84,765	404,162	433,053
Iron Pyrites ..... "	148,651	19,375	618,283	91,604
Lime ..... bush.	4,982,912	2,610,129	1,799,763	1,172,680
Mica ..... tons.	717	222	51,394	29,630
Mineral water ..... Imp. gals.	127,150	.....	15,059	9,000
Natural gas ..... M cu. ft.	10,545,000	8,590,000	3,163,500	2,953,000
Peat ..... tons.	3,900	500	15,600	2,000
Petroleum, crude ..... bbls.	181,750	172,859	724,145	466,716
Quartz and silica brick ..... tons.	94,650	12,957	366,441	74,635
Salt ..... "	206,612	149,599	1,544,867	1,509,287
Sand and gravel ..... cu. yds.	2,162,241	1,412,956	1,390,704	668,098
Sand-Lime brick ..... M.	27,703	.....	407,766	456,700
Stone, building, trap, granite, etc	.....	.....	3,944,972	1,812,863
Talc, crude and ground ..... tons.	20,359	9,967	306,319	140,390
Total non-metallic			$24,795,194	$20,554,185
Add metallic			48,281,553	27,574,202
Grand Total			$73,076,747	$48,128,387

(a) Recoveries from Canadian refineries only.

(b) Copper and nickel exports in the form of matte were valued, respectively, at 12½ and 25 cents per pound in 1920, and at 10 and 20 cents in 1921.

(c) Exports and shipments to points other than Ontario blast furnaces.

(d) Proportional product from Ontario ore smelted. Figures cover only the first nine months of 1921.

Dividends and Bonuses paid to the end of 1921 amounted to $23,140,734 for gold mining companies, and $84,388,185 for silver mining companies, or a total of $107,528,919.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

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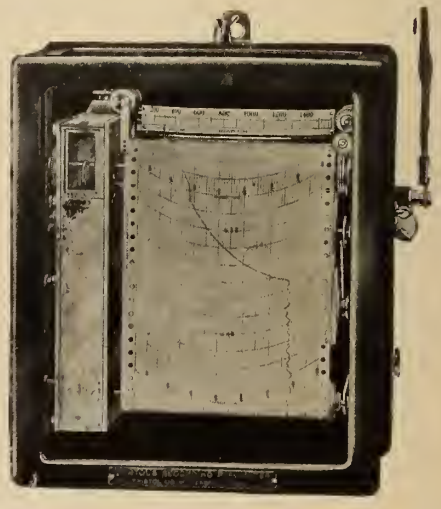

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Per 100 filters	1.26	1.65	1.89	2.55

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Denomination	Tolerance	Denomination	Tolerance	Denomination	Tolerance	Denomination	Tolerance
100 grams	± 0.5 mg.	5 grams	± 0.15 mg.	200 mg.	± 0.05 mg.	10 mg.	± 0.03 mg.
50 "	± 0.3 "	2 "	± 0.15 "	100 "	± 0.05 "	5 "	± 0.03 "
20 "	± 0.2 "	1 "	± 0.10 "	50 "	± 0.04 "	2 "	± 0.02 "
10 "	± 0.2 "	500 mg.	± 0.10 "	20 "	± 0.04 "	1 "	± 0.02 "

The weights are supplied in a velvet-lined, polished mahogany box, with fractionals and riders under plate glass cover, and with ivory-tipped forceps. The fractionals from 1 to 20 mg. are of aluminum, and from 50 to 500 mg. are of palladium and gold alloy or platinum, as may be the more readily obtainable. The fractional pieces have one edge turned in a vertical position for convenience in handling with forceps. One each 5 and 10 mg. riders are furnished with each set.

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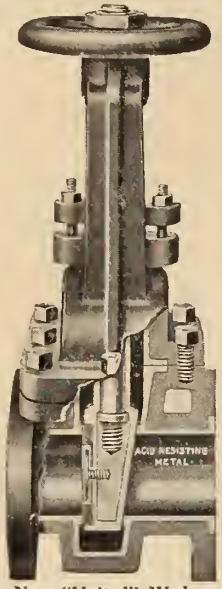

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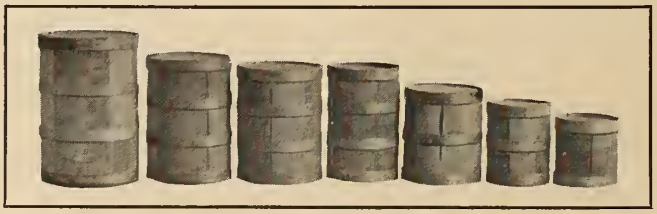

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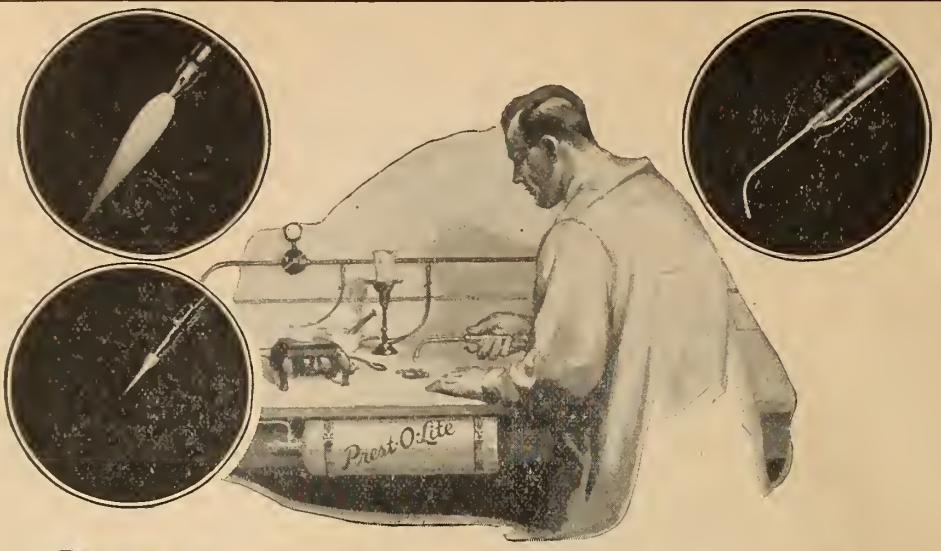

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FROM THE PUBLISHERS—

BEING ESSENTIAL TO PROGRESS

Everyone desires progress, more progress in 1923 than ever before. As publishers of this paper, we also desire to make our service to you continuously greater. It helps a paper a great deal when all readers are in critical sympathy with the publishers' effort to assist their interests in broad and specific lines.

During 1923, we would like to have more direct personal contact by correspondence with a larger number of our readers. We would like to know that they were studying the advertising matter so carefully presented at considerable cost by those who feel that they have a direct service for Canadian Chemists. We would like to feel that Canada's contribution to original industrial and technical literature was increased; and, in general, that a better appreciation of chemistry in industry was being created, through our efforts as your medium of expression.

If your response to our work is more spontaneous and enthusiastic, if your indirect helping of yourself by thinking of other chemists once in a while is continuous, if your sense of professional unity and loyalty is fertilized, 1923 will be a good year indeed for chemists and chemistry in Canada.

Individual effort is essential to personal progress, but collective effort and mutual assistance is the basis of all general influences that operate to make the future situations better.

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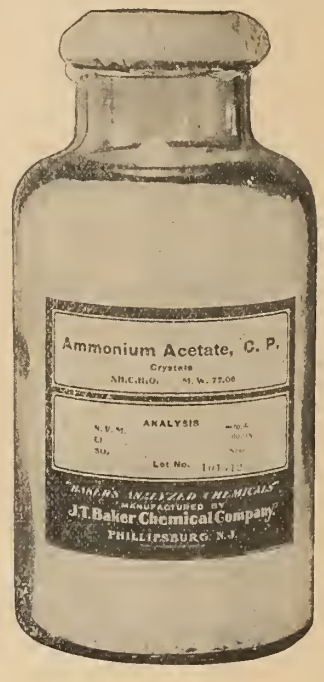

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EDITORIALS

COLLOID MILLS AND ULTRA-FILTER PRESSES

DR. HERMANN PLAUSON bids fair to have started a series of investigations and applications thereof, which may well have a remarkable bearing on manufacturing methods in many industries. Following his first publication in 1920, and the arrival of a very large number of patents, engineers in every country have been considering the application of his methods in new particular cases. The conceptions of Plauson have been worked out, mainly as far as their engineering features go, by Block. Here we have a combination of Russian physical chemistry, with German engineering. Plauson conceived the idea that the reduction of various materials to the colloid condition should be within the scope of a machine, designed to operate at high speed, adopting the principle of the hammer, applied for disintegration purposes in a liquid medium.

Toothed cylinders, rotating in a liquid charge against toothed resistances, causes disintegration, provided the speed is maintained. These peripheral speeds, according to patent claims, may run up to 1,000 meters, and 200 meters has been obtained by direct turbine-driven units. Whether it be an impact mill or a friction mill, a new mark has been set for the engineer in devising equipment which will stand up under the work.

While all this is still in the development stage, there can be little doubt but that these advances have done more than anything else so far to bring the whole world of colloid chemistry well out of the test-tube stage. A new viewpoint is grasped. Instead of retorting shale or tar sands, we may now conceive of running it through a colloid mill. Instead of fuel oil, we can think of a fluid containing a high percentage of colloidal coal. Instead of a milk industry, as we now have it, all milk will be dried without undue heat sterilization and remade by the colloid mill into a rich, creamy milk, with fat particles much smaller than any cow was ever able to produce.

A new field is opened up in the manufacture of lubricants or any combination of oils and solids. Even water may become a valuable lubricating agent. Hydrogenation processes may be modified. Wood cellulose may be made directly. Phosphate rock may be used directly as fertilizer. The paint and varnish industry may be greatly modified The essential oil industry and the production of fruit juices moves on apace. By the use of proper "dispersors," stability may be secured and the effect of weak electrolytes abated. New methods of separation may be developed and chemical reactions accelerated. Soaps will be made in no time at all, and a hundred other present ways and means of doing things badly upset, when the colloid mill in various modified forms becomes a universal manufacturing unit.

Now, the colloid mill would be handicapped, if it were not for its better half, the ultra-filter press, also a Plauson product. Here we have a continuous filtration of colloid materials without cloths, in a machine that can go from a vacuum effect to two hundred atmospheres. The continuous screw effect forces the water through a great many perforations filled with a cake of the colloidal material, eventually discharging at the smaller end of the screw. Here is where the ceramic industry may be interested in dehydration problems. The purification of juices and oils, and even the filtration of water for industrial purposes may possibly be carried to the point where the passage of bacteria is prevented. We might try it out on our high water colloidal peat.

These two new instruments of progress have arrived, and a beginning made in the vast field of application. We trust that Canadian industries may not be slow to investigate and adopt any sound and practical achievement that may result from this work.

ELIMINATING NATIONAL WASTE

IF there are any who deprecate national neatness, and feel satisfied with national untidiness, because it is, to some extent, an Anglo-Saxon characteristic, it is indeed unfortunate. In Canada, the spirit of our people of French extraction, which allows them within the limits of their vision to plan and look ahead, so that their lands and resources may be handed down in good shape and quantity to their posterity, is a valuable national asset.

Too much attention will never be paid to this subject, as the data available on various types of national waste is appalling. One of the chief aims of engineers and scientists in general, and, perhaps, chemists in particular, is to point out and provide means whereby this wastage may be avoided and turned into permanent sources of wealth and benefit.

Our forest strikes us as offering startling opportunities well within our means. Whether it be preservation, distillation, seasoning or direct chemical treatment, as in the paper industry, wood products need more attention. Progress is being made, but not with much national leadership. We skimp and discourage the only minds capable of saving us, to such an extent that it is really remarkable that we advance at all. Arthur D. Little, who is rather noted for large-scale mental

pictures on such subjects, has stated that the waste in four great natural resources (straw, yellow pine, coal and natural gas), would pay the American War Debt. Similar statements can easily be made about Canada. Our problem is to take those from other countries who find the battle in their native land a little beyond them, and, by organized high-pressure application of scientific industrial principles, create an opportunity for them to become self-sustaining and contributors to the world's wealth.

The people, without the planned method of giving them the leadership, will not suffice.

Without mentioning the well known losses from fire, in which accomplishment Canada leads the world, it may be safely stated that we are not fighting insect and fungus pests in agriculture and forest preservation. Our national mentality does not yet consider it good business to even support adequately those who, through their scientific investigations, may hope to point out the cause and cure. Mr. F. J. D. Bornjum, a Nova Scotian of courage, foresight, and, by the blessing of Providence, some means, has been computing the losses from such causes. He says: "The loss from the spruce bud worm, bark beetle and borer, in the three Provinces of Quebec, Ontario and New Brunswick, amounts to at least two hundred million cords. If manufactured into our cheapest paper, it represents a money loss to Canada of more than twelve billion dollars."

Mr. Bornjum, with admirable public spirit, recently offered a prize of $5,000 for the best essay on practical means of fighting this serious peril. The judges, after receiving some two hundred and thirty papers, decided that none of them fulfilled the requirements, but $2,000 was given to Mr. A. Scheirback, forest engineer for Messrs. Price Bros., and the balance distributed to Doctors Swaine, Craighead and Tothill, worthy Government or National servants, whose underpaid investigations were deemed to be the basis of most of the papers. If our so-called industrial and political national leaders can still make satisfactory reports of progress and formulate national aims, without regard to such facts, our situation is indeed unfortunate. The gifts of nature are most remarkable, but not beyond the power of modern man to destroy, although they are seemingly beyond his ability to preserve and utilize to the full.

Fortunately, we can only destroy to a lesser degree our mineral and coal resources, but, according to our opportunity, we manage to abuse and mishandle our fuels. Our appeal is now made to men of science who alone have within them the capacity to alter our national views and direct our energies in this great work. Let the historians of a very few centuries ahead be able to point with just pride to the pioneer thoughtfulness of some in these barbaric industrial dark ages.

ADVANCES IN FIXED NITROGEN PRODUCTION

DEVELOPMENTS have recently taken place in the processes for the fixation of nitrogen from the atmosphere which appear likely to be of immense importance as steps are taken to utilize commercially the results of successful experimental work. The new process is one which should do much to break the monopoly on the one hand of the natural nitrate industry of Chile and Peru, and on the other the synthetic production now in full blast on the Rhine; and its value is particularly outstanding in a country like Canada, which has cheap hydro-electric power and growing agricultural production which must ere long depend to a greater extent than at present on the use of artificial fertilizers, the transportation of which from abroad would necessarily be enormously expensive.

While the great synthetic nitrate industries on the Rhine—at Oppau and Merseburg — are dependent upon a dangerous process based on a constant supply of coal now obtainable in Germany under very great difficulties, the new process is quite independent of fuel, and the transportation of raw materials is thus practically eliminated. The inventor, Signor Casale, has been working quietly for several years past along new lines leading from the electrolytic production of hydrogen from water vapor and its conversion into ammonia and ammonium salts in combination with atmospheric nitrogen. The fact that Italy was, during the war, subjected to almost unbearable hardships, owing to its dependence upon imported coal, rendered essential the development of hydro-electric energy on a large scale, and Signor Casale, in seeking a solution of the fixed nitrogen problem, decided to produce his hydrogen electrolytically, instead of—as in Germany—by the use of coke-oven or other coal gas.

The Casale method is of astonishing simplicity, and it is calculated that when nitrates are produced on a commercial basis by his process, their cost will not be more than one-fourth of that involved in the Haber process, thus superseding not only the cyanamid process, but—wherever hydro-electric power is available—all methods necessitating the use of coal. It is believed further that the installation necessary, if manufactured from modern alloy steels, will be so light and convenient that wherever there is a fair-sized waterfall in an agricultural

district, it will be practicable to set up a small plant for the manufacture of synthetic nitrate fertilizers at an expense not to be compared with the imported article, or that produced by the cyanamid or the Haber processes. One may, therefore, be justified in foreseeing the establishment by concerns utilizing hydro-electric energy intermittently in the course of their usual business, of plants for the production of nitrate fertilizers. Such a method of production should have attractions from the transportation point of view, as cars or steamers coming eastward laden with grain for milling, would be in a position to secure return cargoes of fertilizers for distribution in the identical areas from which the grain borne by them originated.

Signor Casale, whose plant is at Terni, in Italy, is being financed by American interests. This general problem is one which will in itself produce researches until it is solved, and Canada can rest assured that any manufacturing undertaking using hydro-electric power will be very apt to come her way. We hope that these particular patents may prove to be the distinct advance that is anticipated.

PROGRESS IN PEAT FUEL

FOR seven years the Dominion Peat Committee has been experimenting at Alfred, Ontario. Those who have thought that they were asleep up there will be interested to learn that the Committee is now able to deliver peat at around $10.00 a ton of a heating value of 8,000 to 9,700 B.T.U., as against anthracite at $16.00 to $18.00 of around 12,000 B.T.U.

On a basis of the lower heat value of 8,000, and at a price of $10.00, peat has a slight advantage over anthracite at $16.00, with a heat value of 12,000.

Five thousand tons were sold this year at points inside the triangle—New Liskeard-Toronto-Montreal. This is encouraging, but does not solve the Central Canada fuel shortage.

FACING 1923

IT doesn't require any bouble-barrelled optimism to predict that 1923 will be a better year than 1922 in many ways, but chiefly because we have gotten through 1922.

It was a stage in the pathologic experience through which the world has been passing.

Canada enters 1923 with its dollar back to par, a good crop in its barns, and its industries gathering new headway.

PAPER INDUSTRIES EXPOSITION

A new industrial exposition, covering the paper making industry, has been decided upon by the American Paper and Pulp Association, and will take place at Grand Central Palace, New York City, week of April 9th, 1923, under the management of Charles F. Roth and Fred. W. Payne, of the International Exposition Company. The entire field of paper making from the forest to the finished product will be featured.

DR. WADDELL'S SUDDEN PASSING.

It is with deep regret that we record the death of Dr. John Waddell, Professor of Analytical Chemistry, Queen's University, Kingston, who passed away suddenly at Montreal, January 5th. Dr. Waddell was very well known among Canadian chemists, and was held in high regard and respect by his fellow professors at Queen's, and indeed by all those on the scientific staffs of other universities who knew him. As one of the leading spirits in the formation of the Canadian Institute of Chemistry, that organization always had his earnest and cheerful support. A fuller account of Dr. Waddell's career will appear in our February issue.

The Late Dr. Waddell.

DEVELOPMENT OF RESPIRATORS

The new pocket canister is a great improvement over the old respirator for the use of engine crews in passing through tunnels, where they are subjected to so much sulphurous locomotive smoke. It contains an absorbent mixture of activated charcoal and soda lime and is fitted with Turkish towelling filters. These new respirators tested by the United States Bureau of Mines may be made cheaply and will be welcome by engineers who suffer extreme discomfort in tunnels, being subjected to many poisonous gases and extreme heat, caused by the humidity and exhausts of steam and smoke. These respirators have been tested in various tunnels on American railroads and found highly efficient.

The army gas mask though invaluable against the gases met in warfare, is not able to protect against all gases met in industrial life. The Bureau of Mines has been working on a mask which might alleviate the work of rescuers in mine disasters. Their work has been chiefly on self-contained oxygen breathing apparatus and they have been successful in their work on a "terminal" mask which will protect the wearer against all gases commonly met.

The charcoal and soda-lime filled canister protects against certain acid gases and organic vapors. They afford no protection against ammonia, carbon monoxide, found in products of combustion and in producer gas, coal gas, water gas, and blast furnace gas. The pocket canister should not be used in gasoline vapor, wood smoke or fumes such as tin tetrachloride, silicon tetrachloride or sulphur trioxide.

Gasoline Ten Years Hence*

A Survey of the Outlook for Future Supplies, with a Discussion of Potential Possibilities of Oil Shales

By Ralph H. McKee†

PROBABLY the first thing that I should do is to define my terms. All of you have a general idea of what present-day motor fuel or gasoline is; and yet there is some difficulty in defining it in a way which is altogether clear. For the present need, gasoline may be defined as a hydro-carbon distillate, generally a petroleum distillate, 90 per cent. of which boils below 374° F. It has a density of less than 50° Be. To be commercial gasoline it must, in addition, have but slight color and be free from certain types of impurities.

Straight Distillate

Twenty years ago all the gasoline used was obtained as the light low boiling distillate from crude petroleum. This distillate, which might be called crude gasoline, was then chemically treated to give refined gasoline. It is quite easy to make a good quality gasoline from such a quality of petroleum as Pennsylvania petroleum, but when the Pennsylvania fields began to decrease in output and the lower quality oils from Canada, Ohio, the middle west and the far west came into the market, it was found that they did not give either as large a percentage of gasoline or a product of as high a quality as had been given by the Pennsylvania oil. On the other hand, the demands for gasoline due to the growth of the automobile industry were increasing.

The effect of this change of the commercial situation was that lower grade gasolines began to come into the market. These were lower grade, in that they carried some of the higher boiling kerosene fraction, some color and some of the unsaturated constituents which give a stronger odored product. Each phase of this lowering of the standard brought about distinct increases in the amount available, but even under these circumstances, the demand has increased faster than the supply, and accordingly there have been attempts to use other products to supply the deficiency. These attempts have given rise to three new petroleum products—casinghead gasoline, natural gas condensate and cracked gasoline—as well as substitutes quite different from petroleum products.

Cracked Gasoline

When a higher boiling petroleum of the type of the low priced fuel oil or gas oil is heated to a temperature of around 700° F., there is a decomposition of this oil, with separation of carbon on the one hand and the formation of light boiling constituents of the type of gasoline and kerosene on the other hand. This process is known as the cracking of oil and the lighter of the commercial products made is known as cracked gasoline. Cracked gasoline carried up to 40 per cent. of unsaturated compounds.

I should add that the automobile of a few years ago would not run well on the present-day gasoline. Further, it is certain that the gasoline on the market is destined to grow in its content of unsaturated compounds, and we must look to the engine designer to at least keep up and even with the changes in the type of fuel available.

Casinghead Gasoline

Many an oil well gives at the same time considerable amounts of gas as well as oil. If this gas is examined it is found to be formed in part by the evaporation of the same volatile constituents as are present in the liquid petroleum. If we condense the low boiling liquids from this gas, we will obtain a very volatile gasoline. Gasoline obtained from the gas coming from the top of the casing of an oil well is called in the industry "casinghead gasoline."

Gasoline Substitutes

As I stated before, the requirements for gasoline are increasing year by year by very considerable amounts. You in Canada, and we in the United States, have the gasoline cheap and in comparative abundance. This has not been true the world over. We consider 50 cents an imperial gallon high, but most of the world would welcome gasoline at 70 cents a gallon and call it cheap. Europe is using, and has been using as a motor fuel for some time, large amounts of benzol, obtained as a by-product from its coke and gas plants. Germany has been using a product called tetralin. Tetralin is obtained by the hydrogenation of napthalene with hydrogen gas in the presence of nickel. It is a colorless fluid boiling at 205° C., freezing about —30° C. Its properties resemble gasoline and kerosene in fluidity, resistence to low temperatures, and flash point (79° C. = 174° F.). In the motor it explodes smoothly, and shows no tendency to "knock." Due to its low vapor pressure, tetralin must always be mixed with some more volatile fuel, e.g., benzol. In Germany the most used mixture has been equal volumes of tetralin, benzol and alcohol.

The Scottish shale oil plants have been furnishing considerable quantities of a motor spirit from oil shale. Cuba has had a surplus of molasses, this molasses on fermentation giving alcohol; and Cuba has been making extensive use of this alcohol, not only to furnish visitors from the United States with a beverage, but also locally it has taken the place to a considerable extent of gasoline for automobile uses. Natal of South Africa has also an abundant supply of alcohol from its waste molasses. Imported gasoline is quite expensive, and, accordingly, they have devised a product which goes by the name of Natalite, and which has largely taken the place of gasoline in that part of the world. This Natalite is a mixture of alcohol with about 45 per cent. of ether. In the United States we have had but one commercial attempt to supply a gasoline substitute. This is the "alcogas," put out by the United States Industrial Chemical Co. of Baltimore, this company being a subsidiary of the United States Industrial Alcohol Co.

Each of these substitutes has its advantages and disadvantages. Benzol and tetralin are decidedly cheaper than gasoline in Europe, but, on the other hand, they are harder to start the engine, and the tendency toward formation of carbon in the cylinder is greater than with gasoline. Shale motor spirit of Scotland often runs 60 per cent. unsaturated, and, accordingly, it is strongly odored, somewhat colored, and cannot be stored for any considerable time without loss of quality. The alcohol products of Cuba and Natal, particularly when mixed with much ether, as in the case of Natalite, give trouble owing to their great tendency to make the engine "knock," and also some trouble due to the difficulty of obtaining them free from acetic acid. If acetic acid is present, there will be corrosion of the storage tanks, tank cars and the container tanks in the automobile. This corrosion and also the "knock" effect can be reduced and even avoided entirely by adding such material as aniline; but aniline is expensive. One does not want to add any considerable amount of a constituent costing $2.00 a gallon, and aniline cannot be had for less.

"Alcogas" is a more complex material than the substitutes used in other countries. It consists approximately of one-third

*Address delivered before Toronto section, Society of Chemical Industry, November 17th, 1922.

†Head of Department of Chemical Engineering, Columbia University, New York, and Chairman of New York Section, Society of Chemical Industry.

benzol distillate, principally benzol and toluol, a second third of alcohol products, alcohol and ether, and the remaining third of petroleum distillate, principally gasoline. The amount of ether required to easily start the engine varies according to the time of year. In winter 10 per cent., and in summer 5 per cent., is all that is essential. This American gasoline substitute has a big advantage over ordinary gasoline in that the cylinders do not carbonize. This keeping of the cylinders clean means ordinarily a greater mileage per gallon than is obtained from gasoline—about 10 per cent. greater.

Future Demands

The petroleum requirements of the United States and of Canada are steadily increasing, the amount of the increase in the United States being approximately fifty million barrels a year. Part of this increase is due to the increase in fuel oil requirements, but a large part is also due to an increase in the gasoline requirements. Apparently the gasoline requirement of the country is going to continue to increase, and perhaps at an even greater rate than in the past.

The prospects for an increased supply of petroleum from American oil wells are nil. The investigations of the United States Geological Survey and the United States Bureau of Mines show quite definitely that the United States is approximately at its peak of production, and that within a few years, probably within three years, the production of petroleum in the United States from wells will begin to fall off. Moreover, the Geological Survey calls attention to the fact that we should not expect to find any more large fields of petroleum in the United States. In other words, that practically all of the possibilities in the way of large petroleum fields in that country have been well prospected, and that now we can calculate fairly closely what the production will be in the future. This calculation shows quite definitely that it is soon to decrease in amount. Canada is but little better off. In the past, as at present, the United States furnished approximately two-thirds of the world's production. But we are consuming more than we are producing; for example, in 1919 the United States imported fifty-three million barrels from Mexico and in 1920 one hundred and six million barrels. In 1921 the importation was about one hundred and twenty-six million barrels. In each year the United States has imported roughly about 60 per cent. of the total production of Mexico. Mexican and Texas fields are short-life type of fields; already they are in many places furnishing salt water instead of petroleum.

Fundamental Factors and Important Developments in Oil Shale Industry

Four years ago a careful canvass of the situation showed that there was relatively little known about many of the fundamental factors upon which a successful shale oil industry must be based. For example, almost nothing was known regarding the heat of reaction by which shale oil is formed from the organic material of the shale. Little was known regarding specific heats and latent heats, and nothing was known regarding the first reactions that control the formation of oil from the organic material. In the thought that this was going to be an industry of great importance to the country and the world, and that the knowledge of the fundamental factors on which the industry is based were essential to a proper development of that industry, we undertook at Columbia University the study of these fundamental factors. A large part of this work is, of course, yet incomplete, but results have been obtained that are of the utmost importance. It would take several evenings to discuss the methods and the data obtained. To-night I can only give you results.

One of the most important factors entering into the design of a proper shale retort is that of the knowledge of amount of heat absorbed or evolved in the formation of shale oil from the organic matter of the shale. One of our men, Dr. Lyder, devised the first apparatus capable of directly determining this factor and found that heat was absorbed in the process, and that the amount of heat absorbed was nearly the same for shales from different sections. This heat absorption amounted, in general, to about 450 calories per gram of oil and gas produced; or, in other terms, 160 B.T.U. per pound of average shale retorted. This is a surprisingly low figure for such a reaction.

It has been generally thought that the organic matter in shale decomposed on heating to form petroleum products such as gasoline, kerosene, etc., as the primary products of decomposition. It has been known by these researches that this is not the case, but that the primary product of the decomposition is a heavy solid or semi-solid bitumen, and that petroleum is formed by a secondary cracking process from this semi-solid bitumen. This secondary cracking process by which petroleum products are formed is a liquid phase-cracking process similar to the well known phenomena of the cracking of heavy petroleum to give gasoline.

Another surprising thing found was that the decomposition temperature of the shale to give the semi-solid bitumen was a quite definite temperature, one about 410° C.

The investigations have also shown to be incorrect the belief which has been held by many of those working on the developments of shale oil manufacturing processes that on heating, gasoline is the first product formed; then on higher heating, kerosene; and on still higher heating, lubricating oils, etc. In other words, it was shown that what happens on heating is that all these products are formed **simultaneously** by the cracking of the semi-solid bitumen first formed.

Oil shales vary among themselves not only in yield of oil per ton of shale, but also in type of oil, type and character of minor constituents, and also even in the gangue material which carries the organic portion.

Dr. Ralph T. Goodwin has lately shown that if oil shales are distilled at reduced pressure there appears an intermediate product between the kerogen of the shale and the shale oil. This intermediate product is highly unsaturated; indeed, by the customary test by solubility in sulphuric acid some samples show 100 per cent. unsaturation. On heating this product at atmospheric pressure, there is a marked decrease in the so-called unsaturated portion. The unsaturatedness dropped from 100 per cent. to approximately 50 per cent., and on a second distillation at atmospheric pressure it may become as high as 80 per cent. saturated, i.e., but 20 per cent. unsaturated. This, I believe, is the first case where, on cracking an unsaturated hydrocarbon, saturated hydrocarbons are obtained. Further, it raises the question at once as to whether our ordinary conception of the cracking process is a correct one. In this work of Dr. Goodwin and myself we have further shown that the retorting of each shale is a separate problem, and that the problem of refining the oils begins with retorting the shales.

Size and Character of Deposits

In Scotland they are working oil shales which furnish but 20 to 22 gallons of oil per ton of shale mined. In Canada and the United States we have large deposits of shales which are able to give a much higher yield of oil. The largest of these deposits are the Green River shales of Colorado, Utah and Wyoming. There are also large deposits in New Brunswick and Nova Scotia, Nevada, California, Kentucky, Indiana and Ohio, and smaller deposits, though large enough for commercial exploitation, in many other portions of this continent. There are similar deposits in other parts of the world. Of those deposits which are likely to be exploited in the next decade, we have variations in yield from 20 gallons to 60 or even 80 gallons per ton. The large deposits of better grade will give about a barrel (42 gallons) of oil per ton of rock. The character of oil produced in some cases is apparently a straight asphalt-type petroleum similar to California well pet-

roleum. Other shales give a large quanitty of paraffin wax of even better quality than that given by the best oil wells of Pennsylvania's history. In the opinion of the speaker the average petroleum to be made from American oil shale will resemble most closely the petroleum obtained from the present mid-continent field, such as the Oklahoma oil.

It is not commonly appreciated how large these oil shale deposits are. If we consider only those oil shales which will furnish a barrel or better of petroleum per ton of shale (a barrel is 42 U.S. gallons), we have in the Green River section alone, in known deposits, sufficient to furnish 64 thousand million barrels of petroleum. This is an enormous amount. It is eight times larger than the total of the well petroleum that America has produced since Col. Drake drilled the first oil well in 1859 at Titusville, Pa. It is more than five times the total production of the world since well petroleum became commercial sixty years ago.

Retorts and Processes

A shale oil plant, to be successful, must be able to handle cheaply and efficiently large quantities of oil shale, distilling it to get the crude oil and ammonia, and then crack and refine the crude oil to give a motor spirit useful commercially. The Scottish plants do this, excepting that they devote considerable attention to the recovery of paraffin wax, and it is only the oil left after the wax is recovered that is distilled to give lubricating oils, gasoline and burning oils, or is cracked to give shale gasoline.

The Scottish shale retort is, as you noted from the pictures, a retort of vertical pipe type. When we attempt to handle Canadian or American oil shales in this retort we find that they give trouble owing to the pieces of shale sticking together and sticking to the sides of the retort. This caking of the shale lumps stops the passage of the shale through the retort. For use on most of these shales it is quite apparent that we must either modify this Scottish retort or devise retorts on new lines. The Scottish retort is designed with the dual purpose of recovering ammonia from the shale and the obtaining of oil. With the American shales we have larger amounts of oil, but ordinarily distinctly less ammonia, than is produced from the Scottish shale. In other words, the retort to handle the American oil shale **properly** must be one which gives its attention primarily to the production of oil in quantity and of acceptable quality, and only secondarily to the production of ammonia. There are more than a score of retorting schemes which have been proposed by various American inventors. None of these have yet produced shale oil in large quantities. The most completely developed plant and process is that of the Catlin Shale Products Co. at Elko, Nevada. They have a plant which has produced approximately 100,000 gallons of shale oil. They have a small commercial refinery just completed and the first shale oil and shale gasoline to be marketed in quantity in America is coming from this plant. There are probably several other types of retorts which have been proposed for use in distilling oil shale which would, if given proper technical study and trials, develop into commercial processes. At present few, except the inventor himself, believe that any one of these retorts is certain to be practicable when used on a large scale.

It is only within the last three years that serious attention has been given to the question of the development of a proper type of retorting still, and we have no reason to think but that, well before the same length of time from now has passed, we will have succeeded in obtaining a retorting scheme which can handle with low labor costs efficiently and economically Canadian and American oil shales.

A Coming Essential Industry

I have earlier shown you that the American demands for petroleum are increasing at the rate of about 50 million barrels a year. If this continues it will require each year seventy-five new plants, each handling 2,000 tons of oil shale a day, and representing an investment of a million dollars each to give sufficient oil to meet simply this yearly increase in demands for petroleum. We have no other source of fuel oil or gasoline or gasoline substitute in prospect which promise to furnish even a minor part of this demand. In other words, we have reason to look forward to a very large chemical manufacturing industry, which will give us gasoline in quantity from oil shale, and which will rank with our largest manufacturing industries in its labor and capital requirements and in value of output.

DISTILLATION OF CANADIAN HARDWOODS

Dr. John S. Bates, chemical engineer with the Bathurst Co., at Bathurst, N.B., and formerly superintendent of the Forest Products Laboratories, is the author of a new government report on this subject. It appears to be a most complete record of this industry, covering in detail processes used, plants, production and disposal of products, costs, prospects and a bibliography.

A flow sheet, at the very beginning, shows average yields on an imperial gallon basis per cord of wood used. Canadian plants use the rectangular steel oven type of equipment, and their capacities vary from five to ten cords each. The largest Canadian plant has a capacity of 112 cords per day, and the smallest 20 cords. A charge is run from 24 to 30 hours, and heated gradually to the point where the reaction becomes exothermic. The gas is first CO_2, and later increases in fuel value. After some six hours, the pyroligneous acid begins to flow. At about the fifteenth hour, the acid may be up to 12 or 14 per cent. The alcohol flow increases also. After this period, the acid falls off.

In the crude factory, some of the more recent developments have been a pre-heating of relatively green wood with waste hot gases, the use of film evaporators for acetate liquors and multiple-effect evaporators for primary evaporation. The methods used in refining various products as carried on in Canada is presented in good detail. In quantities, costs, yields and methods, the pamphlet is a very complete statement of the scientific and economic condition of this business in Canada.

Our total capacity in some twleve plants amounts to 620 cords per day. On a basis of 20 charges per month, this would amount to 148,800 cords per year. As a matter of fact, this has never quite been reached. In the United States, there are 100 plants, with nominal capacities totalling about 5,500 cords per day. In Canada, we have one general refinery as against some twenty scattered throughout the United States The industry is one which need not be restricted, as our hardwood areas follow the cutting of softwood. The price of this Report is 25 cents, and it may be secured from the Director of Forestry, Ottawa. As an extremely well written essay on a subject in which many chemists have a keen interest and little actual experience, it should have a wide circulation.

INDUSTRIAL LECTURESHIP AT UNIVERSITY OF BRITISH COLUMBIA

Major George A. Walkem, B.Sc., has been appointed lecturer in industrial management on the staff of the department of mechanical engineering at the University of British Columbia. Major Walkem, the University announces, is the first to give his services free of charge to the University for any extended period. His father was a well known lecturer at Queen's University, Kingston. Major Walkem is an active member of the Engineering Institute of Canada, and was this year elected to the Council of that body, and has had long experience in consulting mechanical engineering.

Ammonia as a Refrigerant*---II.

By W. H. Motz

Volumetric Efficiency Due to Clearance

When an ammonia compressor cylinder contains clearance, it is evident that the gases which are compressed into the clearance spaces during the compression stroke will expand during the suction stroke, until the pressure is reduced to that of the evaporator. It is evident that ammonia from the evaporator will not flow into the cylinder until the pressure has been reduced to a point slightly below that of the evaporator. The gases expanding from the clearance spaces will, therefore, reduce the effective volume of the displacement. The magnitude of this reduction of the available cylinder volume will depend upon the amount of clearance, the ratio of compression, and the characteristic law of the gas compression or expansion.

To simplify the calculation, the compression and expansion of ammonia may be assumed to follow the following law:

$PV^n = a$ constant

or $P_1V_1^n = P_2V_2^n$

where P = absolute pressure lbs. per square foot.

V = volume of 1 lb. in cubic feet.

n = characteristic index or exponent.

To further simplify the calculation, the value of n is assumed to be constant. The average value for n, as based on calculations from data determined by the Bureau of Standards, seems to be approximately 1.28.

The relation of the quantities affecting the volumetric efficiency due to clearance is determined by means of the law of thermodynamics, and may be expressed as follows:

$$E_c = 1 + c - c\left\{\left(\frac{p_2}{p_1}\right)^{\frac{1}{n}}\right\}$$

where E_c = volumetric efficiency due to clearance

c = percentage of clearance in per cent. of cylinder volume

p_1 = abs. evaporator or suction pressure

p_2 = abs. condenser pressure

n = 1.28, the constant for ammonia.

The foregoing formula may be transposed to read as follows:

$$E_c = 1 - c\left\{\left(\frac{p_2}{p_1}\right)^{\frac{1}{n}} - 1\right\}$$

Substituting the value, n = 1.28, in the foregoing formula, reduces the expression to the following:

$$E_c = 1 - c\left\{\left(\frac{p_2}{p_1}\right)^{0.7812} - 1\right\}$$

From the foregoing expression, it will be noted that the volumetric efficiency due to clearance for ammonia, depends upon the amount of clearance and the ratio of pressure. The pressure factor in the foregoing equation may be represented as follows:

$$F = \left\{\left(\frac{p_2}{p_1}\right)^{0.7812} - 1\right\}$$

Substituting the value F in the previous equation for the volumetric efficiency due to clearance, the following simplified equation is obtained:

$$E_c = 1 - c \times F$$

The values of the factor, F, in the equation for the volumetric efficiency due to clearance have been calculated and tabulated in Table VI., for the various condenser and evaporator pressures. From Table VI. it will be noted, under the conditions of 5° and 86° in the evaporator and condenser respectively, that every per cent. of clearance in the compressor cylinder will represent a loss of 2.48 per cent. If the clearance is assumed to be three per cent. in this case, the volumetric efficiency due to clearance would be calculated as follows:

$$E_c = 1 - 0.03 \times 2.48 = 0.9256 = 92.56\%$$

The amount of clearance in the compressor cylinder will depend upon the type and relative speed of the compressor. High speed horizontal double acting compressor cylinders have clearance which amounts from two to five per cent. of the cylinder volume. The slow speed horizontal compressor and the vertical single acting compressor have clearances which are reduced to the minimum allowable for safe working conditions. This generally will not exceed more than 1/32-inch linear clearance between the piston and cylinder head.

Effect of Clearance on Mean Effective Pressure

It will be interesting to note the effect of clearance on the mean effective pressure of ammonia as it is compressed in the cylinder. When the ammonia compressor cylinder has clearance, it is readily proven by thermodynamics that the mean effective pressure with clearance is equivalent to the mean effective pressure without clearance, multiplied by the volumetric efficiency due to clearance. This may be shown as follows:

$$m.e.p._c = m.e.p._o \times E_c$$

where $m.e.p._c$ = mean effective pressure with clearance, c.

$m.e.p._o$ = mean effective pressure with zero clearance

E_c = volumetric efficiency due to clearance.

Actual Volumetric Efficiency

The actual volumetric efficiency, as determined by the effect of superheating and clearance, is simply the product of the volumetric efficiencies due to superheating and clearance, and may be expressed as follows:

$$E_a = E_s \times E_c$$

where E_a = actual volumetric efficiency

E_s = volumetric efficiency due to superheating

E_c = volumetric efficiency due to clearance.

TABLE VI.—FACTORS FOR CALCULATING VOLUMETRIC EFFICIENCIES DUE TO CLEARANCE

Saturated Temperature of Liquid in Condenser

Sat. Temp. of Vapor in Evaporator	60° F.	65° F.	70° F.	75° F.	80° F.	85° F.	86° F.	90° F.	95° F.	100° F.	105° F.	110° F.
—40° F.	5.190	5.650	6.130	6.640	7.170	7.710	7.820	8.290	8.890	9.065	10.08	10.85
—35° F.	4.530	4.940	5.360	5.810	6.280	6.780	6.870	7.290	7.820	8.380	8.960	9.058
—30° F.	3.940	4.360	4.690	5.070	5.520	5.950	6.030	6.310	6.890	7.390	7.910	8.460
—25° F.	3.434	3.760	4.100	4.463	4.841	5.230	5.310	5.640	6.061	6.520	6.990	7.490
—20° F.	2.830	3.282	3.585	3.916	4.260	4.610	4.680	4.980	5.370	5.770	6.180	6.640
—15° F.	2.598	2.860	3.140	3.438	3.740	4.060	4.120	4.390	4.743	5.074	5.480	5.890
—10° F.	2.256	2.493	2.742	3.008	3.288	3.565	3.640	3.880	4.190	4.520	4.865	5.220
— 5° F.	1.950	2.168	2.394	2.630	2.890	3.145	3.198	3.420	3.716	4.010	4.320	4.640
0° F.	1.684	1.940	2.088	2.304	2.534	2.771	2.820	3.022	3.280	3.550	3.813	4.135
5° F.	1.443	1.625	1.812	2.080	2.232	2.432	2.480	2.663	2.897	3.150	3.403	3.671
10° F.	1.232	1.395	1.568	1.748	1.936	2.137	2.166	2.344	2.560	2.784	3.018	3.270
15° F.	1.042	1.183	1.348	1.516	1.680	1.868	1.907	2.002	2.257	2.408	2.676	2.902
20° F.	0.872	1.090	1.155	1.306	1.466	1.632	1.666	1.807	1.988	2.178	2.374	2.580
25° F.	0.719	0.846	0.981	1.118	1.265	1.419	1.451	1.578	1.746	1.928	2.110	2.293
30° F.	0.584	0.700	0.822	0.950	1.085	1.226	1.254	1.374	1.527	1.688	1.854	2.060
35° F.	0.460	0.567	0.682	0.798	0.924	1.052	1.079	1.190	1.332	1.478	1.632	1.796
40° F.	0.350	0.448	0.554	0.663	0.724	0.897	0.922	1.022	1.154	1.291	1.443	1.583

*Second and concluding instalment. Part I appeared in December issue, Vol. VI, No. 12, 1922.

Actual Piston Displacement

Since part of the cylinder volume is rendered ineffective, due to the effects of superheating and clearance, it is apparent that the actual piston displacement must be considerably more than the theoretical amounts, which were indicated in Tables III. and IV. It is obvious that the actual piston displacement must be larger than the theoretical amount in direct proportion to the actual volumetric efficiency.

When the compressor has both superheating and clearance effects, the actual displacement is found as follows:

$$AD'' = \frac{TD''}{E_a}$$

Also, when the clearance is reduced to a minimum, the actual piston displacement is found as follows:

$$AD'' = \frac{TD''}{E_s}$$

Actual piston displacements, in cubic inches per minute for vertical single acting compressors, in good condition and with the minimum workable clearance, have been calculated and are shown by Table VII. These values were obtained by dividing the values of the theoretical displacement from Table IV. by the corresponding values of the volumetric efficiency due to superheating taken from Table V.

The values for the actual displacement of the vertical single acting compressor, as shown by Table VII., contains a factor of safety which amounts to approximately ten per cent.

Effects of Clearance on Horsepower

The amount of clearance in a compressor cylinder does not materially affect the work required to compress the ammonia. It is evident that the work expended in compressing the gases into the clearance spaces will be returned to the piston upon re-expansion. Neglecting the effect of superheating, it is evident that the displacement required for a given amount of refrigeration must be greater than the theoretical amount in direct proportion to the volumetric efficiency due to clearance. This may be expressed as follows:

$$AD'' = \frac{TD''}{E_c}$$

This would indicate that the actual horsepower required with clearance in the compressor cylinder would be slightly larger on account of the friction of the machine for the increased displacement. With the exception of increased friction due to the increased displacement, it will be observed that the displacement with clearance is increased in proportion to the volumetric efficiency due to clearance, E_c, and that the mean effective pressure with clearance is decreased in proportion to the volumetric efficiency due to clearance, E_c. Therefore, it is evident that the clearance does not affect the horsepower required for a given amount of refrigeration.

Power Requirements

Having noted the factors which determine the piston displacement of the compressor cylinder, it is interesting and instructive to study the power requirements for different conditions. It is obvious that work must be expanded in order to compress the ammonia gas from the low pressure in the evaporator to the high pressure in the condenser. The horsepower required by a single acting compressor cylinder is found as follows:

$$\text{h.p.} = \frac{P \times A \times L \times N}{396{,}000}$$

where h.p. = horsepower
P = mean effective pressure in lbs. per square inch
L = length of stroke in inches
N = revolutions per minute
A = area of piston in square inches.

From the foregoing equation for the horsepower, it is noted that for a given size of compressor cylinder, operating at a given speed, the mean effective pressure of the ammonia must be determined. By thermodynamics, it is possible to determine the equation for the mean effective pressure which is as follows:

$$P = \frac{n}{n-1} p_1 \left\{ \left\{ \frac{p_2}{p_1} \right\}^{\frac{n-1}{n}} - 1 \right\}$$

where p_1 = abs. pressure in evaporator, lbs. per square inch.
p_2 = abs. condenser pressure, lbs. per square inch.

Substituting the value, n = 1.28, the above equation reduces to the following form:

$$P = 4.571\ p_1 \left\{ \left\{ \frac{p_2}{p_1} \right\}^{0.2188} - 1 \right\}$$

The values of the mean effective pressure for various temperatures and pressures in the evaporator and condenser, have been calculated, and are shown by Table VIII. For the given conditions, it will be noted from Table VIII. that the mean effective pressure varies considerably with the evaporator and condenser pressure, namely, from 31.74 to 103.5 lbs. per sq. inch. It is further noted that the mean effective pressure increases as the condenser pressure increases, but with a given condenser pressure, it increases with the suction or evaporator pressure up to a certain point, after which it decreases.

In the foregoing formula for the horsepower for a single acting compressor, it will be noted that the displacement per revolution of the compressor is equal to the product of the area of the piston, the length of the stroke, and the number of revolutions per minute. If this displacement is considered as being the theoretical amount necessary to produce one ton of refrigeration, the theoretical indicated horsepower required may be calculated as follows:

$$\text{T.i.h.p.} = \frac{P \times TD''}{396{,}000}$$

where T.i.h.p. = theoretical indicated horsepower per ton refr.

The values of the theoretical indicated horsepower, according to this expression, have been calculated for the various temperatures and pressures, and are shown by Table IX. From Table

TABLE VII.—ACTUAL DISPLACEMENTS OF VERTICAL SINGLE ACTING COMPRESSORS, CUBIC INCHES PER MINUTE, PER TON REFRICRATION

Saturated Temperature of Liquid in Condenser

Sat. Temp. of Vapor in Evaporator	60° F.	65° F.	70° F.	75° F.	80° F.	85° F.	86° F.	90° F.	95° F.	100° F.	105° F.	110° F
—40° F.	23030	23380	23670	24500	25200	25780	25900	26450	27180	28160	28830	30220
—35° F.	19850	20000	20440	20880	21380	21940	22100	22470	23250	23950	24590	25670
—30° F.	16780	17030	17510	17930	18280	18800	18960	19280	19920	20480	21200	21930
—25° F.	14570	14740	15020	15380	15710	16150	16300	16510	17080	17560	18160	18780
—20° F.	12450	12710	12980	13320	13580	13910	14010	14350	14700	15160	15580	16240
—15° F.	10810	11030	11280	11520	11800	12080	12160	12430	12760	13140	13530	14000
—10° F.	9410	9610	9805	10030	10260	10510	10580	10820	11130	11430	11730	12130
— 5° F.	8220	8390	8570	9780	8950	9150	9245	9430	9670	9975	10270	10610
0° F.	7215	7350	7530	7588	7855	8170	8118	8250	8486	8710	8988	9290
5° F.	6350	6455	6610	6758	6910	7080	7126	7370	7470	7650	7881	8170
10° F.	5508	5712	5840	6032	6101	6248	6402	6412	6580	6880	7000	7212
15° F.	4961	5060	5196	5295	5411	5536	5572	5688	5832	5990	6198	6382
20° F.	4420	4508	4620	4708	4830	4930	4960	5062	5199	5349	5505	5679
25° F.	3942	4038	4130	4211	4318	4409	4430	4528	4658	4789	4920	5044
30° F.	3530	3608	3686	3757	3882	3956	3982	4058	4168	4279	4421	4565
35° F.	3166	3241	3311	3379	3483	3543	3568	3658	3756	3867	3964	4111
40° F.	2850	2924	2987	3048	3130	3222	3240	3309	3398	3478	3616	3720

IX., it will be noted that the theoretical horsepower per ton of refrigeration varies within wide limits, being lowest when the condenser temperature is low and the evaporator temperature is high, and being highest when the evaporator temperature is low and the condenser temperature is high.

For the conditions shown in Table IX., the amount varies from 0.198 to 2.398.

It should be observed that the values shown in Table IX. are the theoretical amount of power required, or in other words, the compressor would have to operate at 100% efficiency. Since the actual displacement per ton of refrigeration in the compressor must be higher than the theoretical amount in proportion to the volumetric efficiency of the cylinder, it is obvious that the horsepower requirement would be increased in a similar ratio. Therefore, in order to obtain the actual indicated horsepower, the theoretical indicated horsepower may be divided by the volumetric efficiency of the cylinder. This may be expressed symbolically as follows:

$$\text{a.i.h.p.} = \frac{\text{t.i.h.p.}}{E_a}$$

where a.i.h.p. = actual indicated h.p. per ton refr.
E_a = actual volumetric efficiency of compressor cylinder.

In the event that the clearance in the compressor cylinder is reduced to a minimum, the expression for the actual indicated horsepower will be as follows:

$$\text{a.i.h.p.} = \frac{\text{t.i.h.p.}}{E_s}$$

where E_s = volumetric efficiency due to superheating.

The values of the theoretical indicated horsepower per ton of refrigeration as shown by Table IX., were divided by the corresponding volumetric efficiencies of single acting compressors as shown by Table V. These actual indicated horsepowers per ton of refrigeration for the vertical single acting compressors are shown by Table X. From this table, it will be noted that the indicated horsepower varies from 0.211 to 3.618 for the conditions listed.

In a similar manner, the brake horsepower must be larger than the actual indicated horsepower, due to the fact that power is lost in overcoming the friction of the machine. The power required for the losses in the compressor in relation to the actual indicated horsepower is commonly termed the mechanical efficiency of the compressor. The brake horsepower can, therefore, be obtained by dividing the actual indicated

TABLE VIII.—MEAN EFFECTIVE PRESSURES OF AMMONIA, LBS. PER SQUARE INCH
Saturated Temperature of Liquid in Condenser

Sat. Temp. of Vapor in Evaporator	60° F.	65° F.	70° F.	75° F.	80° F.	85° F.	86° F.	90° F.	95° F.	100° F.	105° F.	110° F.
—40° F.	31.74	33.33	34.44	36.51	38.17	39.69	40.02	41.24	42.92	44.77	45.78	47.58
—35° F.	33.89	35.64	37.42	39.19	41.00	42.77	43.10	44.52	46.29	48.05	49.82	51.60
—30° F	35.87	37.90	39.88	41.91	43.88	45.86	46.26	47.82	49.80	51.80	53.75	55.72
—25°F.	37.80	40.08	42.27	44.52	46.65	48.99	49.23	51.15	53.30	55.58	57.78	60.02
—20°F.	38.25	42.10	44.52	47.03	49.54	52.00	52.50	54.49	56.82	59.35	61.80	64.20
—15 F.	41.25	43.95	46.82	49.50	52.15	54.92	55.50	57.70	60.39	63.05	65.73	68.80
—10°F.	42.65	45.58	48.50	51.45	54.70	57.64	58.30	60.70	63.70	66.60	69.55	72.70
—5° F.	44.09	46.90	51.10	53.54	57.00	60.31	60.46	63.64	66.98	70.30	73.50	76.80
0° F.	45.49	49.52	52.05	55.38	59.00	62.60	63.40	66.39	70.00	73.30	77.22	80.83
5° F.	44.90	49.20	52.66	56.90	60.67	64.37	65.51	66.81	72.75	76.64	80.66	84.80
10° F.	44.28	48.88	53.00	57.60	62.10	66.40	67.80	70.80	75.20	79.42	84.00	88.40
15° F.	43.55	48.40	53.42	58.10	62.90	67.70	68.50	72.15	77.25	82.00	86.72	91.65
20° F.	42.33	47.62	52.90	58.15	63.39	68.55	69.66	73.90	79.18	84.34	88.50	94.60
25° F.	40.32	46.06	52.14	57.50	63.25	69.00	70.10	75.63	80.30	86.20	91.60	97.40
30° F.	37.58	44.10	50.28	56.20	62.43	68.35	69.99	74.90	81.00	87.20	93.30	98.50
35° F.	33.82	40.65	47.46	54.12	60.95	67.58	68.92	74.30	81.10	87.70	94.20	101.0
40° F.	29.36	36.55	44.05	51.30	58.55	65.85	68.70	73.10	80.40	88.15	95.10	103.5

TABLE IX.—THEORETICAL INDICATED HORSEPOWER PER TON OF REFRIGERATION
Saturated Temperature of Liquid in Condenser

Sat. Temp. of Vapor in Evaporator	60° F.	65° F.	70° F.	75° F.	80° F.	85° F.	86° F.	90° F.	95° F.	100° F.	105° F.	110° F.
—40° F.	1.412	1.495	1.547	1.673	1.785	1.871	1.896	1.967	2.069	2.200	2.258	2.398
—35° F.	1.311	1.392	1.478	1.567	1.657	1.752	1.774	1.848	1.942	2.050	2.142	2.263
—30° F.	1.208	1.283	1.370	1.464	1.545	1.641	1.662	1.727	1.826	1.925	2.025	2.132
—25° F.	1.116	1.193	1.271	1.354	1.436	1.532	1.547	1.608	1.708	1.805	1.901	2.003
—20° F.	0.990	1.101	1.178	1.259	1.341	1.425	1.442	1.528	1.595	1.691	1.786	1.879
—15° F.	0.938	1.013	1.092	1.166	1.246	1.326	1.342	1.413	1.484	1.585	1.671	1.776
—10° F.	0.859	0.928	0.998	1.072	1.152	1.228	1.248	1.316	1.397	1.478	1.560	1.653
— 5° F.	0.784	0.849	0.932	0.989	1.063	1.136	1.147	1.218	1.296	1.383	1.463	1.547
0° F.	0.719	0.794	0.844	0.907	0.993	1.051	1.068	1.127	1.205	1.276	1.364	1.446
5° F.	0.635	0.701	0.758	0.831	0.896	0.963	0.983	1.012	1.117	1.188	1.266	1.352
10° F.	0.558	0.623	0.684	0.751	0.820	0.887	0.908	0.957	1.028	1.102	1.184	1.261
15° F.	0.492	0.553	0.620	0.679	0.744	0.810	0.822	0.875	0.947	1.020	1.096	1.171
20° F.	0.429	0.489	0.551	0.611	0.675	0.737	0.751	0.805	0.873	0.942	1.000	1.084
25° F.	0.368	0.426	0.489	0.544	0.606	0.667	0.680	0.741	0.793	0.868	0.930	1.006
30° F.	0.309	0.367	0.423	0.418	0.539	0.696	0.602	0.661	0.724	0.788	0.855	0.924
35° F.	0.252	0.306	0.362	0.416	0.476	0.519	0.542	0.593	0.655	0.717	0.776	0.849
40° F.	0.198	0.250	0.304	0.358	0.413	0.471	0.493	0.529	0.589	0.649	0.716	0.789

TABLE X.—ACTUAL INDICATED HORSEPOWER PER TON REFRIGERATION FOR VERTICAL SINGLE ACTING COMPRESSORS
Saturated Temperature of Liquid in Condenser

Sat. Temp. of Vapor in Evaporator	60° F.	65° F.	70° F.	75° F.	80° F.	85° F.	86° F.	90° F.	95° F.	100° F.	105° F.	110°F.
—40° F.	1.845	1.968	2.057	2.247	2.428	2.582	2.623	2.755	2.947	3.183	3.331	3.618
—35° F.	1.698	1.800	1.930	2.067	2.212	2.372	2.407	2.543	2.718	2.908	3.096	3.343
—30° F.	1.521	1.629	1.759	1.897	2.025	2.178	2.216	2.328	2.505	2.682	2.877	3.090
—25° F.	1.381	1.493	1.603	1.728	1.852	1.998	2.028	2.133	2.300	2.467	2.647	2.850
—20° F.	1.203	1.352	1.462	1.580	1.702	1.826	1.858	1.992	2.110	2.274	2.432	2.611
—15° F.	1.123	1.225	1.334	1.439	1.554	1.676	1.703	1.812	1.946	2.094	2.247	2.433
—10° F.	1.103	1.104	1.201	1.303	1.417	1.528	1.560	1.659	1.792	1.923	2.068	2.228
— 5° F.	0.914	0.998	1.107	1.187	1.288	1.394	1.413	1.516	1.635	1.772	1.908	2.065
0° F.	0.828	0.919	0.990	1.074	1.187	1.272	1.298	1.383	1.500	1.613	1.753	1.896
5° F.	0.721	0.802	0.858	0.971	1.058	1.151	1.178	1.227	1.373	1.479	1.607	1.750
10° F.	0.627	0.705	0.782	0.867	0.957	1.047	1.076	1.146	1.248	1.355	1.484	1.611
15° F.	0.546	0.619	0.702	0.777	0.859	0.947	0.963	1.037	1.137	1.237	1.358	1.478
20° F.	0.472	0.542	0.617	0.691	0.774	0.853	0.872	0.945	1.040	1.138	1.229	1.358
25° F.	0.402	0.470	0.544	0.612	0.691	0.768	0.785	0.865	0.945	1.043	1.138	1.252
30° F.	0.335	0.401	0.468	0.534	0.610	0.683	0.703	0.767	0.853	0.943	1.043	1.146
35° F.	0.270	0.333	0.397	0.462	0.536	0.604	0.621	0.687	0.769	0.857	0.943	1.048
40° F.	0.211	0.267	0.332	0.395	0.463	0.536	0.562	0.611	0.691	0.774	0.869	0.973

horsepower by the mechanical efficiency; this may be expressed in symbols as follows:

$$\text{b.h.p.} = \frac{\text{a.i.h.p.}}{\text{m.e.c.}}$$

where b.h.p. = brake horsepower

m.e.c. = mechanical efficiency of compressor.

The mechanical efficiency of the compressor will depend upon the relative size of the compressor and the care exercised in building the compressor. It is, of course, lower for the smaller compressors, and higher for the larger ones.

After the brake horsepower requirements have been ascertained, the corresponding horsepower of the steam engine or electric motor may be obtained by simply increasing the brake horsepower of the compressor in direct proportion to the mechanical efficiency. The indicated horsepower of steam engines, or the input horsepower of electric motors will be from fifteen to twenty per cent. more than the actual indicated horsepower of the compressors. This means that the combined efficiencies of the compressor and its prime mover would vary from 86.95 per cent. to 83.33 per cent. Assuming that the losses in the machine would amount to twenty per cent., the horsepower consumed would be found by dividing the value of the actual indicated horsepower as indicated by Table X., by 0.8333. The equivalent rating in kilowatts of the power consumed is obtained by multiplying by the constant, 0.746. The corresponding horsepower hours and kilowatt hours may be obtained by multiplying by 24. The equivalent power requirements per ton of ice may also be readily obtained by multiplying by the number of tons of refrigeration required per ton of ice.

Under the conditions of saturated temperatures of 5° and 86° in the evaporator and condenser respectively, and the requirement of 1.6 tons of refrigeration per ton of ice, the following power requirements may be calculated:

$$\text{h.p. per ton refr.} = \frac{1.178}{0.8333} = 1.414$$

k.w. per ton refr. $= 1.414 \times 0.746 = 1.054$

h.p.-hrs. per ton refr. $= 1.414 \times 24 = 33.98$

k.w.-hrs. per ton refr. $= 1.054 \times 24 = 25.3$

h.p.-hrs. per ton ice $= 33.98 \times 1.6 = 54.3$

k.w.-hrs. per ton ice $= 25.3 \times 1.6 = 40.5$

It should be noted that the foregoing power requirements are for the work of compression only. Power required by auxiliary apparatus would be in addition to the above amounts.

Heat Removed in the Condenser

In order for the cycle to be continuous in its effect, the gas leaving the compressor must be returned to the liquid state, after which it is re-admitted to the evaporator by means of the expansion or throttle valve. The gas coming from the compressor is usually at a high pressure and temperature. The pressure of the compressed ammonia gas is such that the mean temperature of the ammonia is a few degrees above the average temperature of the condenser water. The heat, therefore, flows from the ammonia into the water, thereby cooling and condensing the ammonia.

In the first part of the condenser, the hot gases are cooled down to the saturated temperature. At this point, the extraction of heat causes the ammonia to change from a vapor to the liquid state. The extraction of the latent heat of condensation takes place at a constant temperature which depends upon the pressure If heat is further extracted from the ammonia, the liquid itself will be cooled below the saturated temperature corresponding to the pressure.

The heat removed in the condenser may be determined by either of two methods of calculation. In the first method, the heat removed in the condenser may be obtained by the method of the difference of heat contents, that is, the difference between the heat content of the superheated gas as it leaves the compressor, and the aftercooled liquid as it leaves the condenser.

In the second case, it will be noted that the heat removed in the condenser is equal to the sum of the heats absorbed in the evaporator and the heat added to the ammonia during compression. The amount of heat removed in the evaporator by each pound of ammonia is shown by Table I. for different evaporator and condenser temperatures.

It is also noted that for one ton of refrigeration, the heat must be removed at the rate of 200 B.T.U. per minute. The heat added in the compressor may be determined from the horsepower requirements by means of the mechanical equivalent of heat. In other words, for every 777.5 ft.-lbs. of energy expended in the compression of the ammonia vapor, the equi-

TABLE XI.—HEAT REMOVED IN CONDENSER, B.T.U. PER MINUTE PER TON REFRIGERATION

Saturated Temperature of Liquid in Condenser

Sat. Temp. of Vapor in Evaporator	60° F.	65° F.	70° F.	75° F.	80° F.	85° F.	86° F.	90° F.	95° F.	100° F.	105° F.	110°F.
—40° F.	277.3	283.6	287.3	295.3	303.2	309.6	311.4	316.9	325.0	335.1	341.4	353.5
—35° F.	272.1	276.4	281.9	287.8	293.9	300.7	302.2	308.0	315.4	324.4	331.4	341.8
—30° F.	264.5	269.2	274.7	280.5	285.9	292.4	294.0	298.8	306.3	313.8	322.2	331.2
—25° F.	258.6	263.4	268.1	273.3	278.6	284.9	286.1	290.6	297.6	304.7	312.4	321.0
—20° F.	251.5	257.4	262.1	267.1	272.2	277.5	278.9	284.6	289.6	296.6	303.2	311.3
—15° F.	247.7	252.0	256.6	261.1	265.9	271.1	272.3	276.9	282.6	288.9	295.4	303.3
—10° F.	243.0	246.9	251.0	255.3	260.2	264.9	266.2	270.4	276.0	281.6	287.6	294.6
— 5° F.	238.8	242.3	247.0	250.4	254.7	258.2	260.0	264.4	269.4	275.2	281.1	287.2
0° F.	235.2	239.0	242.0	245.6	250.4	254.0	255.1	258.7	263.7	268.5	274.4	280.5
5° F.	231.2	234.0	237.3	241.2	244.9	248.9	250.0	252.1	258.3	262.8	268.2	274.3
10° F.	226.6	229.9	233.2	236.8	240.6	244.5	245.7	248.7	253.0	257.5	263.1	268.4
15° F.	223.2	226.3	229.8	233.0	236.5	240.2	240.9	244.0	248.3	252.5	257.6	262.8
20° F.	220.1	223.0	226.2	229.4	232.9	236.2	237.0	240.1	244.2	248.3	252.2	257.5
25° F.	216.9	219.9	223.1	226.0	229.3	232.6	233.3	236.7	240.1	244.3	248.4	253.0
30° F.	214.2	217.3	219.8	222.7	225.9	229.0	229.8	232.6	236.2	240.0	244.3	248.7
35° F.	211.5	214.1	216.8	219.6	222.8	225.6	226.4	229.1	232.7	236.4	240.0	244.5
40° F.	209.0	211.3	214.1	216.8	219.7	222.8	223.9	225.9	229.3	232.9	236.9	241.3

TABLE XII.—GALLONS OF CONDENSER WATER PER MINUTE PER TON OF REFRIGERATION

Saturated Temperature of Liquid in Condenser

Sat. Temp. of Vapor in Evaporator	60° F.	65° F.	70° F.	75° F.	80° F.	85° F.	86° F.	90° F.	95° F.	100° F.	105 °F.	110°F.
—40° F.	3.327	3.404	3.448	3.543	3.639	3.715	3.738	3.803	3.900	4.022	4.097	4.242
—35° F.	3.266	3.317	3.382	3.453	3.527	3.608	3.628	3.696	3.786	3.893	3.977	4.101
—30° F.	3.173	3.232	3.297	3.366	3.431	3.510	3.528	3.586	3.677	3.766	3.867	3.973
—25° F.	3.102	3.161	3.218	3.281	3.343	3.419	3.433	3.487	3.570	3.656	3.749	3.852
—20° F.	3.018	3.091	3.147	3.205	3.267	3.330	3.347	3.415	3.474	3.560	3.639	3.735
—15° F.	2.972	3.023	3.080	3.133	3.190	3.253	3.268	3.322	3.391	3.467	3.544	3.640
—10° F.	2.916	2.963	3.012	3.063	3.122	3.178	3.195	3.247	3.312	3.380	3.450	3.534
— 5° F.	2.864	2.908	2.964	3.006	3.056	3.098	3.120	3.173	3.234	3.002	3.373	3.447
0° F.	2.822	2.869	2.903	2.947	3.005	3.048	3.062	3.105	3.164	3.222	3.293	3.366
5° F.	2.773	2.809	2.849	2.896	2.939	2.988	3.000	3.026	3.100	3.154	3.218	3.292
10° F.	2.718	2.759	2.798	2.842	2.888	2.934	2.948	2.983	3.037	3.090	3.158	3.222
15° F.	2.678	2.717	2.758	2.796	2.839	2.882	2.892	2.928	2.980	3.030	3.090	3.154
20° F.	2.641	2.677	2.714	2.755	2.794	2.833	2.844	2.881	2.930	2.980	3.026	3.090
25° F.	2.602	2.639	2.678	2.712	2.753	2.791	2.800	2.840	2.881	2.932	2.981	3.037
30° F.	2.570	2.608	2.638	2.673	2.711	2.749	2.758	2.791	2.833	2.880	2.932	2.983
35° F.	2.538	2.570	2.602	2.636	2.673	2.708	2.718	2.750	2.791	2.837	2.880	2.935
40° F.	2.508	2.534	2.570	2.602	2.636	2.673	2.687	2.711	2.752	2.794	2.843	2.896

valent in heat units will be one British thermal unit. Remembering that one horsepower is equivalent to the performance of work at the rate of 33,000 ft.-lbs. per minute, the heat equivalent of one horsepower would be equal to 33,000 divided by 777.5, which is equal to 42.44 B.T.U. per minute. The heat equivalent of the horsepower developed in the compression of the ammonia would be equal, therefore, to the actual indicated horsepower multiplied by the constant 42.44. The heat to be removed in the condenser would, therefore, be expressed as follows:

$$H_c = \text{a.i.h.p.} \times 42.44 + 200$$

Where H_c = heat removed in the condenser, B.T.U. per min.
a.i.h.p. = actual indicated horsepower of compressor.

The values of the actual indicated horsepower per ton of refrigeration for various evaporator and condenser temperatures are shown by Table X. The values of the heat removed from the condenser for the corresponding temperatures have been calculated and are shown by Table XI. The values of the heat removed in the condenser will vary from 209.0 to 353.5 B.T.U. per minute, being lowest when the condenser temperature is low, and the evaporating temperature is high, and highest when the condenser temperature is high and the evaporating temperature is low.

Gallons of Water per Minute per Ton of Refrigeration

Water is commonly used for the absorption of heat in the condenser. The water absorbs heat in passing through the condenser by means of a rise in temperature. The most economical rise of temperature of water as it passes through the condenser will depend upon several factors, such as the quantity of water available, cost of the water, relative temperature, etc. In actual practice, when the initial temperature of the water is low, the water is given a larger temperature range in passing through the condenser than when only water at a higher temperature is available.

For simplicity in calculation, the water will be assumed to have a range of ten degrees. Since one gallon of water weighs approximately 8.33 pounds, the number of heat units absorbed by one gallon of water in passing through the condenser would be equal to 8.33×10, which equals 83.3 B.T.U.

The gallons of water per minute per ton of refrigeration will be found as follows:

$$\text{G.P.M.} = \frac{H_c}{83.3}$$

The number of gallons of water per minute per ton of refrigeration for the different temperatures in the evaporator and condenser may, therefore, be obtained by simply dividing the values for the heat removed in the condenser as shown by Table XI., by the constant 83.3. The number of gallons of water per minute per ton of refrigeration for absorbing the heat in the condenser thus calculated is shown by Table XII. From this table it will be noted that the quantities vary from 2.508 to 4.242 gallons per minute per ton of refrigeration. If temperature ranges of the water as it passes through the condenser other than ten degrees are used, the gallons of water per minute minute may be taken from Table XII., in direct proportion to the ration of the assumed temperature rise of the water to ten, which was the rise of temperature used in calculating Table XII.

From Table XI. for the conditions of 5° and 86° in the evaporator and condenser respectively, it will be noted that the heat to be removed in the condenser is 250 B.T.U. per minute. The effect of various temperature rises of the water as it passes through the condenser for these conditions is shown by the following tabulation:

Temp. Rise of Water.	G.P.M. per Ton Refr.
16	1.875
14	2.142
12	2.500
10	3.000
8	3.750
6	5.000
4	7.500

A perusal of the foregoing data and tables will indicate the relative magnitude of the temperatures, pressures, heat quantities etc., at all points of the compression refrigerating system for all operating conditions. A study of this data will show how the relative quantities vary with a change of operating conditions. By carefully noting the relationship between the various factors in the compression refrigerating system, as portrayed by the foregoing Tables and principles, the designer or operator of this type of refrigerating system will be able to predict or maintain the most efficient working temperatures and pressures for a given set of conditions in an actual refrigerating plant.

MOISTURE CONTENT OF WOOD DETERMINED QUICKLY

The Forest Products Laboratory of the United States has evolved a method by which the moisture content of pulp wood chips can be determined in from seven to ten minutes. A specified weight of wood chips, usually 100 grammes, is immersed in kerosene in a flask or retort, and the mixture is heated. The water in the chips changes to steam at 212° and goes through a glass tube in the cork of the flask, is condensed by a water jacket surrounding the tube, and caught in a measuring glass. The boiling point of kerosene being higher than that of water, all the moisture will be driven off the chips before the oil vaporizes to any great extent. The oil that does go off in the form of vapor is condensed and caught in the same graduate with the water. When the evaporation of moisture is complete, the oil and water are allowed to remain a few minutes until the water has all settled to the bottom of the graduate. The amount of moisture in the wood chips is then found by a direct reading. This method has been checked for accuracy with the method of weighing samples before and after oven drying, and the variation found to be less than 1 per cent.

PULP AND PAPER ASSOCIATION TO MEET IN MONTREAL

On January 25th and 26th, the Canadian Pulp and Paper Association, including several sections, will meet at Montreal at the Ritz-Carlton Hotel.

Among the subjects of live interest this year will be the question of how far a paper-mill can go in the utilization of dead or dying timber. Dr. John S. Bates, Chemical Engineer of the Bathurst Company, will contribute some work in this field. In the matter of the future of forest research work, Mr. Ellwood Wilson, of the Laurentide Company, will lead the discussion.

The whole of the week will be one of special interest to the pulp and paper industry, as the annual meeting of the Newsprint Service Bureau will be held in Montreal at this time.

WOOD PRESERVATION

Decay in wood is caused by wood-destroying fungi. To prevent the fungous infection, a preservative must be able to penetrate the wood thoroughly enough to form a continuous exterior shell of poisonous-treated wood, deeper than any surface checks which are likely to develop.

The preservative must not be poisonous to men and animals, neither highly inflammable or injurious to wood, bolts, iron, steel or brass, which come in contact with it in use. Color, odor and effect on paint are important.

As yet, few materials have been found to have value as wood preservatives. Byproducts, for which no other use has been found, are being tried for wood preservatives, such as Condensed smelter fumes, waste sulphite liquor, tannery refuse, and many others, but so far, little success has been attained.

THE CASALE NITROGEN FIXATION PATENTS

Several interesting patents have been registered by Luigi Casale of Rome, Italy, of which No. 220483 Canada is the most recent. These relate to the production of ammonia and nitrogen compounds by a method of direct union of nitrogen and hydrogen under suitable catalytic conditions. This work is creating considerable interest and is thought by some to be a very distinct advance.

The apparatus in outline consists of an external tube, with thick walls, closed at the ends by strong plates, all made of special steel, intended to withstand pressure of the gases. Two inner concentric iron tubes, having thin walls so joined as to form a hollow, annular tube for the catalytic substance, and a cylindrical space in which to place an electrical resistance, form the chief features. Gases are introduced and drawn off at one end, and the heating element is supported in a tube, screwed into an end plate. The catalytic mass is heated from the centre of the apparatus, and the external tube is subjected to a very indirect heating. This means that the temperature will always remain below the point where the compressed hydrogen will injure the steel. The heating element is readily changed.

The danger of spontaneous heating of the catalyst is avoided by causing the gases entering the catalytic chamber to contain a considerable quantity of ammonia. Only a portion of the ammonia is eliminated from the hydrogen and nitrogen. As the temperature of the catalytic mass rises, the initial presence of the reaction product tends to diminish the quantity of ammonia formed more rapidly than the percentage equilibrium would diminish, up to the point where the percentage of combustion is zero, owing to the fact that the percentage equilibrium is equal to the initial quantity of ammonia. For example, the presence of 5% ammonia in the reacting gases, at a pressure of 700 atmospheres, reduces but little the percentage combination caused by a given catalytic mass at a temperature of 500°, but does not reduce the percentage combination in the same catalytic mass at 750°. In the first case, the percentage equilibrium is around 37%, and in the second 9%. The maximum heat development in the second case is only one-eighth of that in the first, due to the initial presence of 5% of the product.

Since the high percentage combination is the principal cause of the dangers of overheating in the catalytic mass, it is natural that these dangers should manifest themselves equally, if, instead of increasing the pressure, one diminishes the temperatures of the catalysis, employing catalysts that are very active at temperatures lower than those employed at the present time. For example, with a catalyst capable of working normally at 400 degrees, at a pressure of 200 atmospheres, one may arrive at a percentage combination of 36%. One can easily see how, in this case, when, for any reason, the temperature of catalysis is elevated, the initial presence of ammonia in the reacting gases would rapidly influence the percentage combination, and therefore the heat produced by the reaction. In fact, since at 600 degrees the percentage of ammonia in the equilibrium is 8.25, at this temperature the thermic effect of the reaction is reduced to a little more than three-quarters of that obtained at 400 degrees; while, with an initial ammonia content of 5%, the thermic effect, which is reduced by only one-seventh at 400 degrees, is reduced nearly nine-tenths at 600 degrees.

Moreover, the presence of the ammonia increases the specific heat of the reaction mixture, which assists, though in a smaller measure, to diminish the possibility of overheating in the catalytic mass.

Finally, the last advantage realized in the present invention is the influence of the reaction product in starting the reaction of catalysis, and on the durability of the catalyst itself.

In these words Dr. Casole describes one of the principles of his method of production. The fact that the units are small, and are not dangerous or difficult to operate, would seem to allow a production of chemicals or fertilizer whenever there was idle or potential electric power available. If the patents prove to be as claimed they will modify considerably certain branches of our chemical industries, and if electric power is required Canada should be able to secure her share of the business.

BENTONITE AS AGENT IN THE DE-INKING OF PRINTED PAPER

Although the de-inking of paper used for magazines and better class paper has been practised for some time, it has not heretofore been possible to apply the same process to ordinary newspaper because the strong alkali solutions and the subsequent bleaching operation discolor any pulp containing ground wood, and the product is only fit for quite inferior work. In this connection, therefore, it is interesting to note that, as a result of experiments at the Forest Products Laboratory at Madison, Wisconsin, it has been found that the natural mineral substance, "bentonite," is a very efficient agent for de-inking old newspapers. This substance had been described as a natural soap, because of its market detergent qualities, but is actually a very fine cream colored clay, which is said to occur in finer particles than any other known mineral, and will go into colloidal suspension in water without the aid of alkalis. In the experiment tests the bentonite was used with just sufficient alkali to loosen the ink without discoloring the paper. The fine particles of the mineral then gather up the loosened carbon, and the mixture can easily be carried through the ordinary washing screen. The result is a sheet almost equal in quality to the original, and it is claimed that from 2,500 lbs. of old newspaper 2,000 lbs. can be recovered by this process. In view of the depletion of our available spruce areas and the slow growth of new forests, we can realize the importance of this discovery in the future of the newspaper industry, in as much as it accomplishes the economic use of old neswpaper and the conservation of our pulp resources. Bentonite was first discovered in Canada in 1911, by Joseph Keele, ceramic engineer of the Department of Mines, at Camrose, Alberta, and later along the Red Deer River in Alberta, and in the Nicola Valley in British Columbia. Consequent upon inquiries directed to the Department of Mines by the Imperial Mineral Resources Bureau regarding the occurences of bentonite in Canada, an extensive investigation is being carried on in the Mines Branch Laboratory at Ottawa, which will enable definite conclusions to be drawn regarding the suitability of Canadian bentonites for industrial purposes and possible further uses for the material.

DETERIORATION OF STORED CEMENT

Deterioration of cement stored in bulk is less than in bags, owing to the smaller area exposed, states the United States Bureau of Mines, as the result of an investigation to determine the cause of deterioration of Portland cement during storage and transportation. Hydration takes place only at the exposed surface, and the bulk of the cement is unaffected. Cement transported in bulk must be shipped in a tight, closed car, and must be protected from moisture during loading, shipping, and unloading, preferably it should be used immediately after unloading at the point of destination. This practice is now followed by several manufacturers and where conditions are suitable it is becoming more common as its advantages are seen, Shipping in bulk effects a saving by eliminating the use of bags —which is an important item in the cost of cement—and it should also permit a saving in freight rates. Details of a study of the storage and transportation of Portland cement, with bibliography on the subject, are given in Serial 2377, obtainable from the Bureau of Mines, Washington, D.C.

Chemical Society News

Containing Official Announcements of the Canadian Institute of Chemistry.

GREETINGS FROM PRESIDENT, CANADIAN INSTITUTE OF CHEMISTRY

To Members of the Canadian Institute of Chemistry and Professional Chemists Throughout Canada

FELLOW CHEMISTS,—

As President of the Institute, I would like to extend best wishes for the New Year, not only to our members, but to all Canadian Chemists. The Institute was founded to serve the whole profession, and the basis of organization is such that service can only be given efficiently to all parts of the country when the general support and enthusiasm of Canadian Chemists is obtained. The present officers ask the help of all those interested in the welfare of the profession making the Institute of broader usefulness.

The original members of the Canadian Institute of Chemistry were elected by acclamation at the convention of chemists in May 1919 at Montreal. This nucleus took the necessary steps in organization, and on August 15th, 1921, the Institute was incorporated by Dominion charter. Representative chemists in large numbers have, of their own accord, become identified with the Institute as members. We are now faced with the fact that there are many other chemists who are just as well qualified, and who perhaps feel that the Institute has overlooked its duty, or failed in courtesy, by not extending a personal invitation at the proper time. A professional organization is naturally slow in this respect, compared with a purely social body. At the same time, the Institute is open to every qualified chemist, and desires the professional and personal comradeship of all. To those who have not yet become members a special appeal is therefore made to join the Institute, and take their share in the privileges and responsibilities of co-operation

Yours very truly,

CANADIAN INSTITUTE OF CHEMISTRY,
JOHN S. BATES,
President.

Bathurst, N.B.,
Dec. 26th, 1922.

OTTAWA MEMBERS OF CANADIAN INSTITUTE OF CHEMISTRY HOLD IMPORTANT MEETING

A meeting of the members of the Institute resident in Ottawa and the vicinity was held on Friday, November 24th, in the University Club. Twenty of the twenty-eight local members were in attendance.

Mr. F. G. Wait and Mr. F. J. Hambly who, as members of council, had called the meeting, outlined the chief topics for discussion arising out of the reports of recent council meetings. Mr. Hambly occupied the chair.

The proposals for organization on provincial lines, the question of admitting "affiliated" members, and the need for raising the status of admission to the Institute were the chief subjects which were discussed, frankly and at length. Dr. A. E. McIntyre, Dr. F. T. Shutt, Mr. F. Babington, Mr. A. E. MacRae, Mr. Dick, Col. Jenson, Mr. S. J. Cook and others expressed their views with force and clearness, and, as a result, the following resolutions were passed unanimously:—

1. Proposed by Mr. J. Dick, seconded by Dr. McIntyre.

"Whereas at the organization meeting of the Canadian Institute of Chemistry, held at Montreal, in 1919, it was definitely stated, by all concerned, that this corporation would be founded and maintained upon, and with the same principles and high standing that existed in the British Institute of Chemistry, and that the requirements for membership to the Canadian Institute would be substantially the same standard as those of that body, thus imparting a standing to all members equivalent to that given by membership in the British Institute; and whereas the constitution of the Canadian Institute of Chemistry states, in its charter, that the purpose and object of the corporation is "to raise the profession of chemistry" in that "it may attract a larger proportion of the best intellects and thereby secure a supply of trained chemists," and to "encourage original research, develop and maintain high standards in the profession and enhance the usefulness of the profession to the public," and "to protect the public by gathering together a body of chemists who may be consulted with confidence;" and whereas at the annual meeting held in 1921, at Montreal, when the proposal was submitted and considered regarding the admission of the Maritime Chemical Society and the Manitoba Chemical Society, there was a unanimity of opinion by the members present, that no person should be permitted to membership in the corporation unless he or she shall be qualified under the by-laws; and whereas, by the admission to membership, in any form, of persons, other than students, not possessing the qualifications, and having complied with the requirements under the by-laws, would be detrimental to the standing of other qualified members, lower their status in the eyes of the public, defeat the purposes and object of the constitution, break faith with the present members, and also destroy any confidence which the public might entertain regarding the value attached to membership in the Institute by reducing its professional status, and thereby generally discredit all those associated with it; and whereas it has been proposed by the Council to admit persons in no way qualified in the profession of chemistry to membership in local branches, to be known as "Affiliated members"; therefore, be it resolved, that the members of the Institute, duly assembled in Ottawa, deprecate further action by the Council upon this matter or proposal, and are unreservedly opposed to the admission, in any way or form, of persons not qualified under the present by-laws of the Institute; and that a copy of this resolution be forwarded to the President and Secretary of the Institute.

2. Proposed by Dr. McIntyre, seconded by Mr. M. F. Connor.

"That this meeting is of the opinion that the formation of an Ottawa branch of the Canadian Institute of Chemistry is undesirable at the present time, but that meetings should be called from time to time by the representative from Ottawa on the Council of the Institute."

3. Proposed by Mr. S. J. Cook, seconded by Mr. A. J. Klock.

"That it is the opinion of the members of the Canadian Institute of Chemistry resident in Ottawa and the vicinity that the time has now come when the qualifiactions prescribed for admission to membership in the Institute should be revised with a view to raising the standards, and in this connection the attention of the Council is respectfully directed to the regulations recently made effective in the Institute of Chemistry of Great Britain and Ireland."

The meeting adjourned at a late hour. It was certainly realized that by such discussion the interest of the members will be greatly strengthened, and that the crystallized ideas and opinions so obtained would be of value to the Council and make for progress in raising the profession of chemistry to its rightful level.

With respect to provincial branches, although no formal resolution was prescribed, it was the opinion of the meeting that the need for organization along provincial lines was not at present urgent.

(Signed) F. G. WAIT,
FRED. J. HAMBLY,
Members of Council.

NEW MEMBERS, CANADIAN INSTITUTE OF CHEMISTRY

FELLOW (F.C.I.C.).

Alfred Woodley Alcock, Chief Chemist, Western Canada Flour Mills, Union Trust Building, Winnipeg, Man.

J. T. Burt-Gerrans, Associate Professor of Physical and Electro-Chemistry, University of Toronto, Toronto, Ontario.

ASSOCIATE (A.C.I.C.).

Everett Drinkwater Timmerman, 260 Bishop Street, Montreal, Que.

STUDENTS' BRANCH, QUEEN'S, HEAR ABLE ADDRESS ON DYE MANUFACTURE

On Tuesday, December 5th, Mr. C. R. Wright, manager, Canadian Dyes, Limited, Trenton, Ont., gave a very interesting and instructive address to the members of the students' branch, Queen's University, Canadian Institute of Chemistry.

Mr. Wright first reviewed the development of the industry from the beginning of modern times up to 1914, showing how by research work the Germans had command of practically the entire dye market at the commencement of the Great War. Dealing with the manufacture, the complex nature of the processes was pointed out. In the case of the aniline dyes three main steps were outlined: First, the formation of coal tar from coal; second, the preparation of dyestuff intermediates in which many by-products are formed; third, the preparation of the finished dyes. Time, pressure and temperature play a very important part in the preparation of dyestuff intermediates. Acetic acid is one of the most important reagents used in their manufacture. The chief difficulty in making dyes is to repeatedly produce the same shade of each color.

In conclusion, Mr. Wright pointed out that while at present only the most common colors were being made in Canada, yet they were on a par with similar colors produced in any other country.

Following the address a discussion of the subject was held in which many of the members took an active part.

D. S. PASTERNACK,
Secretary, Student's Branch.

MANITOBA CHEMICAL SOCIETY, FIFTH ANNUAL MEETING

The fifth annual meeting of the Manitoba Chemical Society was held at the University of Manitoba on November 14th, sixteen members being present.

The following officers were elected for the coming year:—

Executive, Prof. H. E. Bletcher, Dr. J. W. Shipley, A. W. Alcock and Chas. Bentz.

Treasurer, R. H. Fraser.

Secretary, W. A. Davidson.

On December 12th the Society spent an evening with the Food and Drugs Laboratory, Postal Station "B," Winnipeg, twenty-one members being present. Mr. E. L. C. Forster, Analyst-in-Charge of the Laboratory, gave a very interesting paper on "The Growth and Development of Canadian Food Legislation." The subject was treated from an historical point of view, including a brief outline of early efforts during the Middle Ages along these lines in England, France and Germany, relating some interesting facts regarding the regulations in force and the penalties inflicted to offenders in those times. Treated historically, the gradual evolution from the early coarser forms of adulteration to the present scientific subtle practices which may exist was shown. The gradual development of our food laws up to the present was traced particularly, explaining the establishments of standards of quality, and explaining the various Acts now in force—The Canned Meats and Goods Act, The Proprietary and Patent Medicine Act, The Narcotic Drugs Act, and The Food and Drugs Act as at present administered by the Department of Health.

W. A. DAVIDSON,
Secretary

DEVELOPMENTS IN OXY-ACETYLENE WELDING

Reviewed Before Toronto Section, S.C.I.

One of the most interesting addresses that the Toronto Section, Society of Chemical Industry, has been privileged to hear was that on "Oxygen," by Dr. Kinsey, professor of Shop Practice, Stephen's Institute, Hoboken, N.J., and consulting engineer of the Air Reduction Company, at the regular meeting of the Section held at the Engineers' Club, Friday evg., December 8th. Dr. Kinsey is recognized as one of the real authorities on oxy-acetylene welding and hydrogen cutting operations, and the large attendance not only of members of the Section but also of executives from the various local industrial gas producing companies and heads of the welding departments of several of the city's largest machine and railway shops, was very gratifying indeed. The usual informal dinner preceded the meeting.

The major part of Prof. Kinsey's presentation of the subject was in the form of motion pictures showing the development of welding from the village blacksmith shop up to the present day, when it has really become a branch of engineering. The pictures were very fine indeed, and the illustrations of manufacturing methods were particularly well done.

Prof. Kinsey first pointed out that the old time village blacksmith was one of the first to make use of welding operations, and to-day many of the blacksmiths had installed oxy-acetylene equipment. There were three basic forms of welding he pointed out: the lap weld, such as the blacksmith used by placing one piece over another at the end to be joined; the butt weld, by placing the pieces against each other, end to end; and the cleft weld, by making a cleft in each piece and inserting one into the other. Old methods of welding were conducted with the metal in a plastic state, whereas to-day the metal is in a liquid state.

So far as is known the first attempts to use the oxy-acetylene flame for welding was at the Topeka, Kansas, shops of the Santa Fe Railroad, though it was also introduced in the shops of the Chicago and North-Western R.R. at almost the same time. The blacksmith of former days welded machine steel only, but the oxy-acetylene flame could weld a non-ferrous metal such as brass with machine steel. This development in the art had only taken place by long periods of experimentation in machine shops. Tribute must be paid, said the speaker, to those welders in the railway shops who had experimented, often in the face of strong prejudice.

In explaining why oxy-acetylene welding was so superior to old methods, Prof. Kinsey emphasised first, the fact that it was a fusion weld instead of a plastic weld; secondly, because the operator has full control of the intensity of the flame; and, third, because oxidation is or can be entirely prevented by a proper handling of the flame, melting rod and the work. The oxy-acetylene flame is 6,300° F. at the top, 4,000° F. halfway, and 2,300° F. at the end; so that by simply raising or lowering his flame the operator can give heat varying from 6,300° F. to 2,300° F. There is no chance of oxidation occurring around the weld if the operator is competent, for the flame spreads over the pool of molten metal created, and there is complete combustion.

An excellent example of "crossing" of difierent metals in welding was given as the case where steel railway rails are bonded by copper wire for purposes of return current on electric lines, or for signal purposes on steam lines. In this case a melting rod of bronze was used. It was only after considerable prejudice had been overcome that the railway

companies would permit the oxy-acetylene equipment to be used for this purpose. Recently an entire through line of the Southern Pacific in California had been bonded this way.

The hammer refining of welds would increase their efficiency 25 per cent. This was due to the fact that the crystals of the metal when heated become unlocked, and, on cooling, the weld is weaker because of the unlocked condition of the crystals, whereas if the metal on completition of the weld is cooled slowly, the crystals will begin to lock again and then by use of the hammer they can be practically all relocked. The question of the proper kind of melting rod was important. Tank steel has a tensile strength of 50,000 lbs. per square inch so that in cases of welding with tank steel the efficiency of the weld could be increased from 10 to 30 per cent. by using a melting rod of nickel steel, which has a tensile strength of 80,000 lbs. per square inch.

In discussing the use of the oxy-acetylene flame for cutting purposes, Dr. Kinsey stated that the purity of the oxygen should be from 98 to 99 per cent. The other one per cent. of "nitrogen" was not detrimental, and half of it was really argon. Hydrogen had its important place, too, in the case of thick cutting, i.e., over 30 inches thick. The hydrogen and oxygen flame will cut nickel steel as thick as 40 inches.

Mechanical cutting was one of the interesting operations illustrated in the pictures, 250 feet of 3/8" steel being cut in this way.

Following the address, the chairman, Mr. L. E. Westman, opened the meeting for questions, and a lively discussion followed.

Mr. McAlpine, superintendent of the machine shops of the local C.N.R. terminal, enquired regarding the method to be followed in the case of firebox which had split for some three feet. Dr. Kinsey pointed out that this was one of the real difficult things to do well, but that, if other schemes failed, it could be accomplished by cutting a section out and setting a new piece in, or by careful preheating of the parts to be joined and making a dam of asbestos cement around the weld, so that the heat from the flame is not transferred over more surface than the parts the flame plays on.

Mr. Mackenzie, of the Maintenance of Way Department of the C.P.R., stated that as yet they had not used the oxy-acetylene welding on rail bondings. Prof. Kinsey pointed out that over 20,000 joints had recently been done by oxy-acetylene welding on the Southern Pacific R.R.

In discussing the packing of the acetylene cylinders with acetone, the speaker said that 35 lbs. of acetone were put into each acetylene cylinder. The acetone was first put in and then the acetylene allowed to enter slowly, so that it is absorbed by the acetone—then when pressure falls the acetone releases the acetylene. As a sponge for the acetone, corn pith is used.

There was absolutely no danger in handling the acetylene or oxygen cylinders if a few simple rules were followed. Should an acetylene cylinder get on fire, a great rush of flame and noise was produced, but by simply turning off the stop-cock this would be immediately stopped. This, of course, required cool-headedness.

There was one rule that should be strictly enforced, and that was "Never let oil near the oxygen cylinder." Various accidents that had occurred in connection with oxy-acetylene equipment had been due to disregard of this rule. The danger of course is from spontaneous combustion.

In reply to Prof. Geo. Evans, Dr. Kinsey stated that there were no harmful light rays emitted from the oxy-acetylene flame, such as the ultra-violet or infra-red rays. Masks were worn, and should be worn, by operators simply to protect their faces from any chance flying piece of the hot metal. The rays from the electric arc flame were injurious to the eyes.

OTTAWA SECTION, S.C.I., DISCUSSES INDICATORS

A well attended meeting of the Ottawa Section, S.C.I., was held at the University Club, Ottawa, December 15th, with Mr. F. J. Hambly in the chair.

A letter from Dr. Armstrong, the Society President, was read by the chairman, and much appreciated by the members.

The matter of publicity was discussed. The Secretary urged that something should be done at once to initiate a definite line of action. Mr. Gilmore outlined what might be done, and Mr. Gilmore and the Secretary were appointed a committee to co-operate with the local press, and were asked to report to the next meeting.

It was announced that the subject of the January meeting would be that set down on the program for the March meeting, the two subjects being interchanged to suit the convenience of the speakers. This means that Mr. Ross Gilmore will give the address on " The Denatured Alcohol Situation in Canada," on March 8th, while "Chemistry in the Canadian Civil Service" will be the subject at the meeting on January 11th, presented by chemists in the Government service.

The chairman urged that as many of the Associates as possible become full members of the Society, and that we endeavor to increase our membership for the New Year.

The change in the Society journal was outlined by Dr. Macintyre. In accordance with the usual practice, the chairman asked for comments on current literature. Dr. Macintyre stated that "Outlines of Science," by J. Arthur Thompson, was very interesting, and should be read by all.

Dr. Waddell, Professor of Chemistry at Queen's University, then gave an address on "Indicators," the object of which was to give evidence that indicators which change color with a pH above 7 are acid, those which change color with a pH below 7 are bases. At the outset the speaker showed very clearly the meaning of pH, the term being used to designate the logarithm of the inverse of the H ion concentration. He performed experiments with various indicators to bring out the points of his address, and while not fully satisfied that the evidence given was sufficiently conclusive, he considered that while there seemed to be anomalies it appears that in some way the hydroxyl ion acts in cases where pH is above 7 and the H ion below 7.

Mr. C. H. Robertson showed some apparatus consisting of a poyentiometer and a Leeds Northrup electrode for pH determination which are being used in the Experimental Farm Laboratory, and described some of the methods in use in connection with pH values in soils, milk, canned goods, etc. He thought this determination would be very useful in soils, in giving a more correct opinion of the reactions in soil, and there seems to be a very definite connection between the pH of flour and its baking value. The chairman suggested that the Section visit the Farm Laboratory and personally view the operation of the apparatus. After an interesting discussion a very hearty vote of thanks was extended to Dr. Waddell for a most interesting and instructive address.

A. E. MacRae,
Hon. Secretary.

SYMPOSIUM ON PHYSICAL CHEMISTRY AT ROCHESTER

The Rochester Section, American Chemical Society, has been fortunate in securing Professor Theo. Svedberg, University of Upsala, Sweden, to act as Presiding Officer of a Symposium on Physical Chemistry, which will be held in Rochester on Friday and Saturday, January 19th and 20th.

Papers will be presented at this Symposium by prominent physical chemists from Schenectady, Cornell, Syracuse, Buffalo and Rochester. Practically every phase of physical chemistry will be dealth with, with the exception of colloids. On this phase there will be no papers, since a colloid symposium will be held at the University of Wisconsin later in the year.

The Rochester Section extends a personal invitation to anyone interested in this Physical Chemistry Symposium to be present and take part either in the presentation of papers, or in the discussion which will follow the papers.

SHAWINIGAN SECTION, S.C.I.

On November 28th a meeting of the Shawinigan Falls Section, Society of Chemical Industry, was held at the Electro Products Camp at the Falls. Mr. John Grieve, sales manager, Dominion Paint Works, Limited, Montreal, read a very interesting paper on "Paint,"

S.C.I. MAKES CHANGE IN OFFICIAL JOURNAL

The Society of Chemical Industry has announced some changes in the official journal of the Society, which has been heretofore published semi-monthly under the name "Journal of the Society of Chemical Industry." It has been decided to publish the journal weekly as two new journals. Journal (1) will contain the Abstracts and Transactions, and will be entitled "Journal of the Society of Chemical Industry, Chemistry and Industry," while journal (2) will contain the Review giving news and developments in the industry as well as original articles, and will be named "Chemistry and Industry" published by the Society of Chemical Industry.

LATEST INSULIN DEVELOPMENTS

Perhaps the chief session, from the viewpoint of interest and application, at the Toronto meeting of the Federation of American Societies for Experimental Biology, was that of December 28th, when several papers were given on the recently-developed method of curing diabetes.

Papers were presented by J. J. R. Macleod, F. G. Banting, C. H. Best, G. M. Dobbin, J. B. Collitt, John R. Murlin, and various other associates. From the chemical standpoint, the principal facts presented were: Insulin, as first prepared at Toronto, contained protein, but does not give general protein reactions. Definite amino acids were recognized. When insulin from the ox is treated with phosphotungstic acid, the filtrate contains insulin, and it is concluded that the insulin is in the pure state, not a protein. Heating for some time in acid solution does not destroy it; neither does a moderate alkaline solution. It is finally destroyed more quickly in alkaline solution than in acid. It is absorbed by kaolin, and has dializing properties. It is reduced in potency by passage through a Barkefeld filter It is destroyed by digestive ferments.

Methods of physiological assay are difficult. Individual animals respond over a wide range to equal doses. Two methods have been tried: (1) by measuring its strength by injections of glucose, which would be neutralized according to insulin present; (2) by using adrenaline, and counteracting with insulin. Neither of these methods have shown remarkable results, but the latter is the better. No better method than subcutaneous injection has been found. Absorption through mucous membrane or oral administration have not yet met with any success.

CHEMICAL EQUIPMENT ASSOCIATION BEGINS WORK

The Chemical Equipment Association, comprising manufacturers of equipment essential to manufacture in the score or more of chemically-controlled industries of the continent, has established national executive offices at 1328 Broadway, New York City.

It has begun work through a national membership for the fostering of trade in chemical equipment, and for the improvement of practices in the production and distribution of such equipment, and in the performing of engineering services incidental thereto.

Not only does its activity signalize the adoption of trade association methods by the companies constituting the equipment base of the nationally vital chemical industries, but it represents a movement toward manufacturing and distributing co-operation in these same strategic points that has attracted the attention of United States Secretary of Commerce Hoover, who personally encouraged the organization of the Association.

The Chemical Equipment Association was organized September 12th, 1922, following preliminary activities of an organization committee of representatives of leading manufacturers.

The officers of the Association are: President, Pierce D. Schenck, President, The Duriron Co., Inc., Dayton Ohio; Vice Presidents, J. George Lehman, Vice President and General Manager, Bethlehem Foundry & Machine Co., Bethlehem, Pa., Walter E. Lummus, President, The Walter E. Lummus Co., Boston, Mass., Adolph Coors, Jr., Vice President, Coors Porcelain Co., Golden, Colorado; Treasurer, Percy C. Kingsbury, Chief Engineer, General Ceramics Co., 50 Church St., New York City; Secretary, Roberts Everett.

The Directors are: H. N. Spicer, The Dorr Co., New York City; P. S. Barnes, The Pfaudler Co., New York City; Edwin C. Alford, T. Shriver & Co., Harrison, N.J.; T. C. Oliver, Treasurer-General Manager, Chemical Construction Co., New York City; Hamilton Allport, E. B. Badger & Sons Co., New York City.

THE JOURNAL OF PHYSICAL CHEMISTRY

Dr. Wilder D. Bancroft, after 18 years' faithful service in publishing this journal, has turned it over to the Chemical Society of London, the Farady Society, and the American Chemical Society.

Canadian chemists will note with interest that the American Chemical Society has appointed Dr. W. Lash-Miller, of the University of Toronto, as one of their four consulting editors, and the Chemical Society of London has appointed Prof. J. W. McBain, of Bristol, a Canadian trained under Dr. Miller, as one of their three editors.

PERSONAL

Mr. H. C. Barlow, B.Sc., formerly of the Chemical and Metallurgical Branch of the Dominion Bureau of Statistics, has returned to his former position as assistant chemist for the Deloro Smelting and Refining Co., Deloro, Ont., having resigned from the Bureau.

Mr. F. Donald, B.Sc., son of Mr. J. T. Donald, head of the well known firm of J. T. Donald & Co., Ltd., Montreal, chemical engineers and analysts, has joined the sales staff of E. A. Schofield & Co., chemical importers and exporters, Montreal and Toronto.

GOVERMENT POSITIONS OPEN

Assistant Chemist, $2,400, Dept. of Agriculture. University graduate in chemistry, with three years' experience in laboratory work; some post-graduate research work preferred. Maximum, $2,580.

Junior Chemist, $1,680. University graduate in chemistry, or equivalent, with one year's experience in practical laboratory work. Maximum, $2,040. Experimental Farm, Dept. of Agriculture.

Address, Civil Service Commission, Ottawa.

STATISTICAL CLERK WANTED FOR CHEMICAL BRANCH, BUREAU OF STATISTICS

Applications are open for the position of Principal Statistical Clerk (male) for the Mining, Metallurgical and Chemical Branch, Dominion Bureau of Statistics, Ottawa. Salary and qualifications are given in the advertisement of the Civil Service Commission, page 50.

New Books Reviewed

"Handbook of Chemical Engineering," By D. M. Liddell. Two Volumes. 1,008 pages, 6 x 9. Flexible Cover. McGraw-Hill Book Co. Price $8.00

It is a pleasure to announce and review these books. Any chemist or chemical engineer that does not read them with a sense of personal satisfaction in what the author has done for him should at once commence to write a better book on the subject. Casting aside all minor matters, the judgment of the author in selecting his subject matter and balancing the space seems to be about right, having in mind American practice.

Some thirty-four individuals have given of their best ideas and experiences and most of them are very well known nationally in chemical circles. For many readers, nearly every chapter will be found to have been written by an old friend. The author states plainly that he is not concerned with the fact that a chemical Britannica has not been produced. We venture to believe that a textbook on chemical engineering has been created, which will be looked upon as manna from above by all those who attempt to teach the subject, and that this work will take its place along with other works on standard engineering practice which are considered essential to a good library.

The first volume deals with generation and transmission of power, material handling, solids, liquids, gases, crushing and grinding, grading, mechanical separation, concentration, leaching and dissolving, evaporating and drying, crystallization, thermometry and pyrometry, refractories.

Volume II. covers high temperature production, mixing and kneading, sampling, fermentation, distillation, (fractional and destructive), refrigeration, oxidation and reduction, electrochemistry, catalysis, colloid chemistry, smelting and roasting, lutes and cements, radio active elements, rare metals, rare gases, materials of construction, plant design and methods of financing.

The combined efforts of these authors constitute a distinct step forward to a more concrete defining of the present limits and place of chemical engineering in industry.

"Handbook for Electroplaters," By John F. Locke. 901 Fisher Place, Cincinnati, Ohio. Price $1.00

The Fundamentals of chemistry and electricity, as they pertain directly to the electroplating industry.

"The Analysis of Rubber," By John B. Tuttle. Chemical Catalog Co., Inc., New York. 150 pages. Price $2.50

This monograph is written for chemists in laboratories, where rubber products come up for testing and analysis. It will be found extremely valuable in most laboratories where rubber goods are manufactured. Having in mind the average reader, some attention is given to the preparation of rubber compounds and the physical testing of rubber. Methods are given in very practical detail, along with a wealth of secondary information which every chemist setting out to carry on such work should have. A very excellent bibliography is given.

"The Mineral Industry," Vol. XXX. for 1921, By G. A. Roush and Allison Butts. McGraw-Hill Book Co. 895 pages. Price $10.00

This is an annual review of progress in the mining and metallurgical industries. The data and information is gathered from world-wide sources and for any particular subject is treated by some individual who is in a position to review and discuss the same properly. Each mineral or metal is treated in one chapter, and statistics for the year, special mining developments, and new methods of ore dressing and recovery discussed. The work is distinctly international in scope, with United States affairs stressed. Canada is well covered, as our government reports and published literature allow the author to secure the necessary data.

As a series, the work is a history of mining and metallurgy, and probably the best single series available. The book has a business value and could well be read by many who have no technical interests. As a work of reference, it should have first place, as the statistics given are closely checked. Its annual publication is indeed a very praiseworthy effort.

"Modern Chemistry," Pure and Applied

Vol. V., By Arthur J. Hale, 280 pp. Virtue & Co., London. (Westman Press, Ltd., Toronto). Price $4.50

The whole treatise deals with all branches of chemistry. Of course, there is a limit to the treatment, but the author has accomplished something not usually attained. He maintains interest, makes chemical formulae hatch out into industries, and, at the same time, does enough fundamental teaching to assure himself that the reader is a real chemist. By slashing detail, there appears to be a residue of data left, just about equal to the average capacity of the non-specialist. The illustrations are always page size and represent real working units.

This particular volume deals with organic chemistry, or rather some phases of it. There is little organic chemistry mentioned for the mere purpose of recording data, but for the greater part is brought in, around and through certain real industries. For example, chapter one mentions aromatic amines, dye intermediates, dyes and explosives. Another field of organic chemistry is grouped under the head of synthetic drugs and pharmaceutical products, in chapter two. Chapter three deals with carbohydrates, paper and textiles. Food products and biochemistry are treated together, and there is a special chapter on heterocylic compounds. The place of this set would seem to be with the man who did not wish to compete with a library, but still desired to have a uniform series of several volumes, which would contain an interesting paragraph or two on a great variety of chemical subjects and individual compounds. The author in this series has worked out something very useful to a number of people, and of permanent value in the literature of chemistry.

"Technical Methods of Ore Analysis"

By A. H. Low. 2nd Edition, 350 p.p. John Wiley & Sons, New York.

The book is a text for technical chemists and students, and covers chief industrial elements. The book is already well known in a great many laboratories and colleges, and has met with success in the field. In this edition, more attention is given to the problems of method in teaching quantitative chemical analysis, manipulation and the art of correct thinking when carrying on an examination of an unusual ore.

The author recognizes that it is a task indeed to secure a sufficient amount of analytical thought from students, and that there are many chemists in plant work that are neither clear thinkers nor finished manipulators.

The methods given are set out in excellent detail, and full advantage has been taken of the long, practical experience of the author. This edition contains a number of new methods or modifications, and can be recommended rather highly as a reference work.

'Chemicals and Industrial Materials With Their Commercial Uses"

By Charles Argles, Birmingham, Eng. Price $2.50. (Westman Press, Limited, Toronto)

A very useful book of reference for manufacturers, importers and business men generally. It gives in alphabetical order, the principal chemicals and materials and the industries in which they are employed, and a converse list of some of the principal industries showing the chemicals and materials used in their operations. The data concerning the commodities are arranged in two sections, the first devoted to chemicals and their industrial uses and the second to industrial materials, such as oils, gums, soaps, etc. Over a thousand commodities are listed. That the book should prove of practical value to sales managers, and importers can readily be seen. Quite often a firm will have an over supply of a certain chemical or material on hand, and

finding all their usual outlets closed are at a loss to know how or where to dispose of it. In such cases this book should find a real use. Probably the success with which the book has already met is due to the fact that the publisher, Mr. Argles, is himself a produce broker and importer, and knew by personal experience the need for such a work of reference. The work must have entailed a great deal of patient research in its compilation. It is, so far as we are aware, the first of its kind ever published, and should prove, as the author states in the preface, a useful guide in the daily development of business.

"Chemical Analysis of Lead and Its Compounds"

By John A. Schaeffer, A.M., Ph.D., Vice-President and Chief Chemist, Eagle Picher Lead Co., in Collaboration with Bernard S. White, Assistant Chemist and General Superintendent of the Joplin Plant of the same company. Second edition, 160 pp. Eagle Picher Lead Company, Chicago. Price, $1.00.

This is the second edition, revised and enlarged by J. H. Calbeck, A.M., Director of Research of the Eagle Picher Lead Company, and is a practical laboratory manual for chemists and students of chemistry. The best methods of analysis, as adopted by the leading laboratories are given. It embraces principally the analysis of lead ores, red lead, litharge, sublimed white lead. sublimed blue lead, corroded white lead, pig lead, antimony alloys, spelter, zinc oxide and lithopone.

The company is not in the publishing business, therefore, the price of the book is just sufficient to cover its actual cost.

Dr. Henry A. Gardner, director of the Institute of Paint and Varnish Research has made the following statement in regard to the book:

"This is probably the best book of its kind that has recently been published. It gives complete methods for the analysis of lead ores, sublimed white lead, corroded white lead, sublimed blue lead, zinc oxide, lithopone, red lead, orange mineral, litharge, pig lead, spelter, and lead alloys. Many short cuts are indicated. Of special value are the methods relating to the titration of lead oxides. The chapter on calculating the lead content of sublimed white lead, by determining lead and zinc, is especially good. The chapters on alloy analysis will be found of very great help to those having to do with alloys. The book will prove an invaluable adjunct to the library of every paint laboratory."

" Canada as a Market for British Goods."

Selwyn & Blount, Ltd., London. 245 pp. 7/6.

The marketing of British goods in Canada is something which many old country firms have before them at the present time. The situation of Canada, next door to the United States, presents certain problems not found in other markets. The field has not been well developed in the past in many instances, and this work, written by one who has information to give and some really constructive ideas, should be useful. Those seeking the agencies of English houses, or already handling British goods, will read it with interest.

DEATH OF J. D. MACKENZIE, GEOLOGICAL SURVEY

J. D. MacKenzie, superintendent of the British Columbia branch office of the Canadian Geological Survey, died while under an operation at the military hospital at Ste. Anne Bellevue, near Montreal, on December 15th.

Mr. MacKenzie was born at Baddeck, Cape Breton, in 1888. He graduated at the Massachusetts Institute of Technology, and became demonstrator in geology first at Cornell University and afterwards at the Massachusetts Institute of Technology, and spent his summer vacations in field work for the Canadian Geological Survey, finally joining the permanent staff of that institution. When war broke out, he joined the 185th Cape Breton Highlanders as a private, and rose to be a captain of the regiment. On August 10th, 1918, he was awarded the Military Cross, and three weeks later was wounded, and later invalided home to the military hospital at Esquimalt, B C. The wound, which was in the lung, never healed, and necessitated the operation, from which he failed to rally. He resumed work on the Geological Survey in 1920, and in the same year was appointed Superintendent of the Vancouver Branch office, on the elevation of Charles Camsell to Deputy Minister of Mines. For the last three summers he has been making a survey of the coal resources of Vancouver Island, and had found that an early estimate, made before a great deal of development had been done, wildly excessive. He was a member of the Canadian Institute of Mining and Metallurgy, and has contributed many papers to the proceedings of the society.

TURPENTINE INDUSTRY IN BRITISH COLUMBIA

The Douglas fir tree of British Columbia is a great potential source of turpentine and resin for the chemical industry. At a recent session of the Provincial Legislature, there was passed an amendment to the Forest Act, whereby the Provincial Government is authorized to issue resin leases and to collect a royalty of three-quarters of a cent a gallon on all resin gathered, in addition to the fees and rentals paid into the Forestry Protection Fund. The amendment was passed, only after demonstration by and reports from forestry officials, showing that tapping for resin does not injure growing trees. Under the old system of scarifying the barks of the trees and collecting the resin after the more volatile elements had become oxidized by contact with the air, it was not possible to secure more than 17% of the bulk of the turpentine. In Eastern Canada the highest production is only 15%. In British Columbia the lowest returns have been 33%, or 1% higher than in Germany, where the resin by-product industry has been developed to an art. The highest collection is achieved by boring a small hole into the tree-trunk and hermetically sealing it with an air-tight flask; the resin being in the nature of fecal matter which the tree is seeking to rid itself of, the quality of the timber and the rapidity of growth are therby aided. A theory to explain why larches and pines send out resin is that pines and conifers are survivors of a cold epoch, and the only way in which the germ of life in the tree could endure was by the tree evolving a non-freezable and non-swelling substance to enwrap and protect the cells. Such a substance is turpentine, which forms a large element of tree resin. With the change of climate the trees find themselves with this supply of resin for which they have no use; consequently they are always trying to get rid of it by discharging through the roots and abcesses on the trunk. Among the valuable products obtained from Douglas fir resins are: Turpentine for oils which form the base of fruit extracts used at soda-fountains; medicinal oils, etc.; and resins which make varnishes of the highest excellence. Printing inks are also made from these resins, one of the most interesting of which is Burgundy pitch; it is snow white, and is used as white lithographic ink. A local company has started operations on Cortez Island; also Campbell's River, 60 miles north of Vancouver. It is estimated that a block of 100 acres of Douglas fir trees gives about 800 barrels of pitch per acre, or a total of 50,000 gallons. The company is working on trees of not less than 10 inches in diameter; some of the large trees yield as much as 40 gallons at the first tapping. One gallon of sap produces about one-half gallon of turpentine; while the residue is rich in by-products. Forestry experts declare the Douglas fir to be the most valuable tree in the world for commercial purposes, not even excepting the rubber trees.

The British Chemical Industries in 1922

Review of Industrial and Market Conditions

(Specially prepared for CANADIAN CHEMISTRY AND METALLURGY by our Overseas Correspondent.)

WHILE it would be difficult to assert with any degree of confidence that the British chemical and dyestuffs industries are yet approaching normal conditions of activity, there have during the past few months been a good many signs of gradually increasing business. The decrease in the cost of labor and the consequent reduction which it has been possible to make in the selling prices of marerials have probably been the chief agents in the progress which has been made towards the re-establishment of the trade. Speaking generally, the home trade in both heavy and fine chemicals and also in dyestuffs had suffered from the inability to compete with imported goods from abroad. Taking as an example the case of salt, last year the imports from abroad amounted to 22,000 tons of German material and 57,000 tons of the solar product, a total of 79,000 tons, in spite of the fact that England has important deposits of both rock salt and of brine. The fine chemical manufacturers and the dyestuffs industry are relying upon Government support to secure by means of the Safeguarding of Industries Act some relief from foreign competition until such times as trade is normal and until the demand for their own products is stronger than it is at the present time.

When the year opened in January last the chemical trade had not recovered from the extremely depressing effects of the stoppage of the coal mines during the preceding summer. Furthermore, the gradually falling tendency in the prices of most materials has caused buyers to refrain from purchasing except in a hand-to-mouth fashion, very few contracts having been placed. On the other hand, certain trades which are large users of chemicals and dyestuffs have improved with a consequent increase in their demand for raw materials. This improvement, in most cases, became most marked towards September, there being, of course, noteworthy exceptions, such as in the fertilizer section, where early spring is the busy season. Cheaper production rates made themselves more felt towards the autumn, and to this in particular may be attributed the increased trade. As regards export trade, an excellent feature is that in countries where the drawback of cheap currency does not operate, and in markets where no duties nor limitations are placed on imports, British chemicals are finding their way in considerable quantities. It is reported in many cases that overseas buyers are willing to pay a shade higher price for British goods, and in other ways show a preference for standard chemicals produced in Great Britain. During September, the Government's mishandling of the Near East crisis caused much comment, and was a disturbing factor in the export market, but with improved conditions resulting from the hopes of a peaceful settlement a speedy increase in tonnage and value of chemical exports will doubtless be registered. Exports of chemicals, drugs, dyes and colors from Great Britain during the ten months ended 31st October reached a total value of £16,846,980, as compared with £16,152,051 for the corresponding period of 1921, in spite of the fact that prices this year have been considerably reduced. These exports included 113,280 tons of sulphate of ammonia, worth £1,851,971, last year's figures being 108,707 tons, valued at £2,367,448. Of dyes and dyestuffs, apart from vegetable products, the exports amounted to 80,506 tons, worth £602,764, as compared with 111,237 tons, valued at £1,413,526, during the corresponding ten months last year, coal tar products accounting this year for 39,195 tons, valued at £523,686, as compared with 71,367 tons, worth £1,322,038 last year. Other coal tar products, including anthracene, benzol and toluol, carbolic acid, naphtha, naphthalene, tar oil, creosote, etc., accounted for exports worth this year £1,050,201, as compared with £1,077,450 for the ten months ended October 1921. Of soda compounds the exports were this year 6,942,422 tons, worth £3,830,755, as against 3,403,-551 tons, valued at £2,582,767 last year; and of painters' colors and materials not elsewhere specified there were shipped abroad 1,009,167, worth £2,410,834, as compared with 730,441 tons, valued at £2,315,012. British imports of chemicals, drugs, dyes and colors this year to the end of October amounted to £9,309,856, as compared with £10,849,593 last year.

The Fertilizer Market.

With respect to the fertilizer market, the situation for the forthcoming season promises to be interesting, so far as sulphate of ammonia is concerned. At the end of June this product was quoted at £15 per ton, delivered, as compared with £16 per ton, delivered, at the end of May. During the summer demand has been slack, but it is now fairly certain that British manufacturers will not be able to cope with the demand during the next six months. The shortage will doubtless be accentuated in view of the possible depletion of stocks of nitrate of soda and the stoppage of supplies from Ebbw Vale.

The Textile Industry

The textile trades have been rather busier of late, and consequently the chemicals and dyestuffs used in that industry have been in greater demand. Soda ash is steady at £7 17s. 6d. per ton; bleaching powder is in fair demand, but towards the end of September was reduced to £11 15s. per ton; caustic soda is firm at about £20 5s. per ton for 70-72 per cent. and £22 5s. for 76-77 per cent.; sodium bi-chromate is in fair demand at 5¼d. per lb., but caustic potash is quoted at the reduced price of $29 per ton for 88-92 per cent. material. Textile manufacturers are now feeling some of the benefits of the increased specialization in dyestuff manufacture in Great Britain. Although not a few were inclined to complain when the licensing of foreign dyestuffs was begun, on the ground that it was difficult for them to obtain the colors they required, this licensing appears to be progressing rather more smoothly at present. British dyestuff users are, however, being reminded that there are definite ranges of colors, such as basic, vat, etc., now produced in Great Britain which were not made here before the war, and which are now quite comparable with the corresponding continental colors. A large volume of research continues to be done annually in the dyestuff manufacturing concerns of England and Scotland, and the results are to be found in the better quality, increased fastness, lower prices and widened range of British colors.

Tar Products and Miscellaneous Chemicals

The market in tar products has been very quiet, with the exception of the pitch section, which has been fairly steady throughout on continental inquiry. Towards the autumn, benzol, toluol, crude carbolic acid and creosote were in rather better demand. The naphthalene market, however, was almost consistently poor throughout the season.

The miscellaneous chemical product market has been distinctly patchy during the whole year, but in several sections has latterly developed considerable promise. For example, an increased demand has recently sprung up for alum, the price being at the middle of November £13 10s. per ton for the lump product in bags. Organic acid products have been indicative of the uneven character of the market. Cream of tartar has recently sold better on export account, the reason for which, however, may be placed to the credit of reduced prices. On the other hand, citric and tartaric acids have been in reduced demand towards the end of the summer, but oxalic acid has been sold in increasing quantities at around 7½d. per lb. Acetic acid and acetate of lime have both

developed a good degree of steadiness, the latter being in very short supply. Acetate of soda has also been in demand, but on account of recent shipments from the Continent acetate of lead has been offered at lower rates, and even so much selling pressure has been exerted to clear the goods.

Germany Loses Prestige in Market

In many departments of chemical manufacture the feature which has perhaps most impressed itself upon buying communities during the past year is the loss of command of the market which German chemical manufacturers have suffered. Not only is this apparent in Great Britain, but reports from overseas markets, particularly those of the United States and Japan, point to the displacement of German chemicals by domestically manufactured products. Most countries which are users of chemicals to any great extent have erected tariff barriers so as to give a certain amount of preference to native producers. While this places a certain restraint on export business it certainly prevents any country obtaining the predominance over the market which the Germans had in pre-war days in chemical products, but it emphasizes the need for patriotism on the part of users of chemicals in Great Britain, so that the British chemical industry shall not suffer unduly.

This remark applies with particular force to the case of fine chemicals. During the war, and after, an enormous amount of research work was done to place Great Britain on a level with Germany and other Continental countries as regards the manufacture of fine chemicals, pharmaceutical products, photographic chemicals, essential oils and synthetic perfumes. Such pharmaceutical products as aspirin, atropine, caffeine, butyl, chloral hydrate, glycero-phosphates, chloral-formamide, hexamine, homatropine hydrobromide, hyocyamine, hippuric acid and lithium, organic arsenicals, phenacetin, quinine and its salts, saccharine, etc., were produced in the highest degree of purity, while research during the war yielded the new antiseptics acriflavine, proflavine, chloramine "T," halazone, etc. Most marked also has been the increase in the number of pure photographic chemicals manufactured in Great Britain, which are now acknowledged by technologists as second to none. A constantly increasing range of synthetic odorous chemicals and essential oils are being produced, and are giving satisfaction to the most discriminating users. The fine chemical section of the industry is, in fact, one of the most progressive of Britain's newer ventures, and there seems, therefore, every reason to believe that in this matter the lessons of the war have been taken to heart, and that a proper place is now being given in Great Britain to the work of the pure scientist and the research chemist.

TESTING STEEL

M. Chatelier recently described before the French Academy of Science a Thermo Electric method of distinguishing between alloy steels of the same hardness. A bath of mercury heated, preferably electrically, to about 120 degrees Centigrade. From one pole of a sensitive millivoltmeter, a piece of electrolytic iron dips into the mercury. The metal to be tested is connected by a wire to the other pole of the instrument and dipped into the mercury. Thermo-electric Electro-Moto-Force set up are characteristic for the different steels. These vary from .10 to 2.1 millivolts. At 120 degrees Centigrade, the thermo-electric effects are sufficiently different to enable a classification of the steels to be made, while the condition of heat-treatment has a negligible effect.

ALGERIAN PHOSPHATE

Algeria ranks second to the United States in the production of phosphate, producing over one-third of the world's supply. Of four main companies operating, the Compagnie des Phosphates de Constantine produces over seventy-five per cent. of the Algerian output.

MINERAL PRODUCTION OF ONTARIO, NINE MONTHS ENDING SEPTEMBER 1922

Marked Increase in Gold Output Recorded

A marked increase in gold output is the outstanding feature in Ontario's metalliferous production for the nine months ending September 30th, 1922. Not only is Ontario a leader among the Canadian Provinces, but for the full year 1922 will undoubtedly surpass California whose gold output was $15,704,822 in 1921. For the third quarter of the year Ontario's production was at the rate of over 22 million dollars per annum or about one-eighth that of the Transvaal for the same period, the average monthly rates being: Ontario, 91,100 ounces; Transvaal, 743,400. The Hollinger mine alone, now treating around 4,500 tons daily, plans increased milling capacity equal to the total of Ontario's producing mines at the present time, or approximately 7,000 tons per day. This expansion is dependent on increased power supply. Two new hydro-electric power projects are now being developed—one at Sturgeon Falls on the Mattagami River, of 6,000 to 7,000 horse power, and one at Indian Chutes, on the Montreal River, of similar capacity. Some of this energy should be available by February next.

For 1921 the exchange premium averaged 11.61 per cent. By the end of August 1922 Canada's currency had reached par. The exchange really amounted to a bonus for the gold mining industry. Canada is the first combatant country suffering currency depreciation as a result of the Great War to get back to normal. The total exchange premium received by gold mines for the nine months' period was $183,354.

The outlook for Ontario's gold mining industry was never brighter. Developments to date and ore blocked out give assurance of permanence. Several prospects are likely to become producers soon. There are many promising areas under development, such as Night Hawk Lake, Lebel and Gauthier townships, West Shining Tree, Larder Lake, Matachewan, Painkiller Lake, and others; also some old mines in North-western Ontario.

Silver Production Well Maintained

Silver production has been well maintained. South Lorrain is attracting much attention as a result of the excellent showing being made by the Keeley and Frontier mines. Both the Miller Lake O'Brien and Castle-Trethewey mines at Gowganda made shipments. The average New York price of silver for the period was 68.137 cents per fine ounce. Shipments of ore, concentrates and residues over the T. & N.O. railway totalled 1,015 tons to foreign countries, principally the United States, and 5,796 to Southern Ontario refineries. Mines shipping over one half million ounces are given in order: Nipissing, 2,959,411; Mining Corporation of Canada, 1,289,401; O'Brien, 884,030; Coniagas, 826,820; and Keeley, 540,350. A summary of shipments follows: Cobalt, 6,473,970 ounces; South Lorrain, 840,466; Gowganda, 118,000; recover from gold ores, 112,890; nickel-copper refining, 4,975 ounces; a total of 7,560,301 fine ounces.

Refineries.—Plants at Deloro and Thorold recovered 1,210,566 ounces of silver and marketed 3,221,791 lbs. of white arsenic, worth $223,949. With the exception of the bulk of the metallic nickel and nickel oxide recovered by nickel refining plants, Southern Ontario refineries produce all of the other nickel and cobalt compounds making up the production.

Nickel-Copper Situation

After a year's shut-down at the Creighton mine of the International Nickel Company of Canada, work was again begun August 26th. The Copper Cliff smelter re-commenced operations on September 1st, when two converters were put in blast, and the Port Colborne refinery re-opened on May 1st. Nickel-copper matte in stock held by the Mond Company has been cleared out for the first time since the armistice. The average price of electrolytic copper was 13.25 cents per pound for the nine months.

During the period 178,044 tons of ore were smelted and 8,857 tons of nickel-copper matte produced. In addition to nickel

and blister copper, gold worth $1,880, silver valued at $3,450, and platinum metals were produced. A large part of the nickel oxide marketed was produced from nickel-copper matte.

Cobalt and Oxides

During the period under review 22,173 lbs. of matallic cobalt were produced, valued at $60,932, as compared with 30,564 lbs. valued at $91,786, for the similar period in 1921. It is encouraging to note, however, that the outlook for the cobalt market is increasingly brighter, and that business, both in cobalt and the cobalt oxides is steadily returning to normal, following the industrial slump of the early part of the year.

CANADIAN MINERAL PRODUCTION, 1922 PRELIMINARY ESTIMATE ANNOUNCED

The Dominion Bureau of Statistics announces that its preliminary estimate of the mineral production of Canada during 1922 shows that the total value amounted to $180,622,000, an increase of practically $6,000,000 over the production of the previous year.

The value of the metals produced was $61,731,000, as compared with $49,343,232 in the preceding year; fuels and other non-metallics dropped $4,000,000 to a total of $83,891,000, and the production of structural materials and clay products has been estimated at the same valutaion as last year, namely, $35,000,000.

In the metals the outstanding feature was the production of gold which for the first time since 1902 was above the million-ounce mark and was 31 per cent. above the production of the preceding year, reaching a total of 1,200,000 ounces.

Silver was 2,000,000 ounces higher than in the preceding year and the total production of 15,726,000 ounces was valued at $10,634,000.

Lead output increased 50 per cent. to a total of 98,738,000 pounds, with an estimated value of $6,141,000.

Copper rose about 3,500,000 pounds to a total of 51,229,000 pounds, valued at $6,833,000.

The output of coal from Canadian mines during the past year was 14,210,000 tons, having an estimated value of $68,349,-500, as compared with an output in the preceding year of 15,-057,493 tons, valued at $72,451,656.

The output of asbestos in 1922 reached a total of approximately 139,000 tons of all grades, valued at $5,200,000, as compared with 92,761 tons, valued at $4,906,230 in 1921. The increased production was due almost entirely to the activity about the mines during the past few months.

The increase in the production of metals during the past year, amounting to approximately $12,000,000 in value, marks a resumption of progress in the metal mining field, and points the way to greater prosperity. The slight decline in the production of non-metallics, including coal, amounted to only about $4,000,000 in value, and since the greater part of this decrease was due to loss of production caused through labor troubles, the slight set-back may be regarded as negligible. In the successful marketing of structural materials and clay products, the revival of the building industry has played a great part, and during the past year the production of these materials has been considerably increased, but owing to the fact that prices have at the same time declined the value of the output in 1922 was only maintained at about the same level as in 1921.

The recovery in mineral production as a whole, then, to a total of $180,349,000 may be considered as most propitious. Comparison with preceding years shows that 1920, 1918 and 1917 were the only years in which this valuation was exceeded.

The work of the Bureau on mineral statistics is carried out in the Mining, Metallurgical and Chemical Branch under the direction of Mr. S. J. Cook.

Mining and Metallurgy in British Columbia

(Special Correspondence to Canadian Chemistr and Metallurgy.)

Large Increase in Lead Output by Consolidated

The Consolidated Mining and Smelting Company of Canada will resume the payment of dividends for the last quarter of 1922, after exactly two years' cessation. The Consolidated has concentrated on the production of lead and zinc almost entirely, and, owning to the change in the nature of the Sullivan mine ore, which has increased in lead content and decreased in zinc, and to the large shipments of lead concentrate and ore that have been received from mines in the Slocan and in the State of Washington, the output of lead for the present year, 1922, will be markedly in advance of that of last year, though the tonnage received at the smelter will be about the same or slightly less. The company will complete the first 1,500-ton unit of its new concentrator at the Sullivan mine in the spring of 1923, and it is estimated that this will bring about an annual saving of between three and four hundred thousand dollars in freight charges alone. At the present time the company has some 800 men employed at Kimberley on the new concentrator and in the Sullivan mine. As copper production has been universally unprofitable during the past year, and is yet at the present time, it is probable that the company will continue to neglect the copper department of its smelter until the middle of 1923, when the concentrator at Trail, which now is being used to treat the Sullivan ore, will have been re-modelled, and will be available for treating ores from the company's Rossland mines.

Electric Energy Replacing Coal for Mine Power

Owing to the continued high price of coal, the three largest metal mining concerns in the Province have turned to electric energy generated by water power, and in the future will use coal only for smelting purposes. This will be a considerable blow to the coal mines, but the coal miners and operators, by their avarice, have brought it entirely upon themselves. For the same reason fuel oil is replacing coal for industrial purposes. The Granby Consolidated Mining, Smelting and Power Company expects to have its new dam completed and its full power plant in operation by the end of January, which will assure the company ample power for all purposes at mine and smelter. The improvements have cost in the neighborhood of $400,000, but it is estimated they will result in a saving of close to $200,000 annually. The Granby Company has closed its Swamp Point quartz quarry, as it now is receiving ample silica for fluxing purposes in the silicious ores from the Premier and Esperanza mines.

B.C. Electric Railway Co. to Supply Power to Britannia

The Britannia Mining and Smelting Company has made arrangements with the British Columbia Railway Company, whereby the latter will provide a supply of 4,500 to 5,000 horse power of electric energy, to operate the mining machinery and concentrator at Britannia Beach for ten years, with an option to renew the contract for an additional five years. The Britannia Company has a 2,735 horse power hydro-electric plant at the mine, but the supply of water is insufficient to maintain the plant at capacity for more than six or seven months in the year. It is expected that the Britannia will put its new 2,500-ton mill into operation in January or February, and will run it at capacity, turning out 40 million pounds of copper in the form of concentrate annually. The concentrate will be smelted at the American S. & R. Co. plant, at Tacoma, Washington. Since the old mill was closed in the fall of 1920, the Britannia Company has been steadily

developing and improving the mine, and now is in a betteri position than ever to produce copper concentrate cheaply.

The Consolidated M. & S. Co. has let a contract to the East Kootenay Light and Power Company for a supply of 10,000 horse power of electric energy for a period of ten years.

Proposed Alaskan Railway to Serve Canadian Mines in Portland Canal Division

Charles F. Caldwell, who secured a charter for a railway on the Alaskan side of the Salmon River valley, has let a contract to Seims & Carlson, railway contractors of Spokane, for the construction of a line from Hyder to the International boundary. When this is completed it is probable that the line will be extended across the boundary to the Canadian side, and on to the head of the valley. The railway will serve the Fish Creek mine, which has reached the shipping stage, and the Daly-Alaska, Alaska-Premier, Riverside, Titan, and Virginia groups, all of which give promise of being developed into producing mines.

Mobile Mines, Limited, has been organized at Stewart, with a capital of $700,000, to take over and operate the Mobile group of seven claims, situated 1,000 feet above the Portland Canal mine, on Glacier Creek. A camp has been established, and a tunnel has been started on a lode, said to average $150 in gold and silver per ton.

Messrs. Trites, Wood and Wilson, of Fernie, of the original syndicate that developed the Premier mine and brought it to the producing stage, has bonded the Stoner group of 20 claims, situated just east of the International boundary and 12 miles from tide-water. Little exploration has been done on this property.

In the Alice Arm district, the Esperanza mine continues to produce good ore, 225 tons of medium grade being shipped to the Granby smelter recently. It is expected that the Baldy tunnel will tap the high-grade shoot, found in the lower workings, within the next few weeks.

Slocan District Developments

H. H. Armstead, well-known Coeur d'Alene operator, has leased the Utica mine for 18 months. The Utica mine has produced some of the richest silver ore found in the Slocan camp. For the last few years the mine has been operated under lease, the present lessee being O. C. Thompson, who has been driving a tunnel to cut the rich ore at a depth of 350 feet. The tunnel is now in 2,400 feet, and it is estimated that it will have to be driven 600 feet further before it reaches its objective.

The American Boy Mining Company, which recently took over the American Boy mine, is sinking a shaft from the No. 7 level in a vein carrying three feet of clear galena that assays 74 per cent. of lead and 115 ounces of silver per ton. This mine had been idle for many years until recently. The company propose to erect an aerial tramway in the spring to connect with the Sovereign mine tramway, which will enable them to ship milling ore to Alamo concentrator and high-grade ore directly to Trail.

The Reco Mines, Limited, has started two tunnels, at 1,500 and 1,900 feet respectively, below the original outcrop. All the lead ore in the upper part of the mine has been stoped out, but a large quantity of good zinc ore, which was considered to be valueless at the time the mine was worked, has been left in the stopes. The new company will attempt to recover this.

The King Jack Mining Company has installed a small complete concentrating plant on its property at Lemon Creek. The plant consists of a crusher, two stamp mill, two Wilfley tables, ball-mill, and a three-cell Minerals Separation machine. The ore is said to average $20 in gold and silver per ton, but there is a shoot of rich ore that assays 230 ounces of silver and $80 in gold per ton.

TALC AND SOAPSTONE IN CANADA

A report just published by the Mines Branch, Department of Mines, under the above title, deals with the talc and soapstone resources of Canada. The author is Hugh S. Spence, and the report comprises eighty pages of text, seventeen illustrations, and a map showing the distribution of the known talc and soapstone occurrences in the Eastern Townships of Quebec.

The report contains four chapters: Chapter 1, including tables of analyses of talcs and soapstones, notes on the distribution of the Canadian deposits, and a statistical section. Chapter 2 is devoted to detailed descriptions of Canadian talc and soapstone mines and occurrences; while Chapter 3 deals with the uses, mining and preparation for the market of talc and soapstone. Chapter 4 contains brief notes on talc in foreign countries. A bibliography of the more important literature dealing with talc and soapstone is appended.

From this report, it appears that while talc is known to occur in Nova Scotia, Quebec, British Columbia and Ontario, the last named province is the only one that has figured at all prominently as a producer.

The Nova Scotia occurrences are small and are not regarded as of economic importance. Quebec undoubtedly possesses important talc deposits, most of them yielding an off-color grade of ground talc, which, however, has good slip, and should be of value for the paper, roofing and foundry trades. A similar grade of talc is produced at several localities in British Columbia; and there is, also, in this province a deposit of cream colored steatite, or massive talc, that shows some promise, and that may, with the improved transportation facilities afforded by the Castle-Windermere highway, prove capable of development.

The principal talc mines of the Dominion lie in the vicinity of Madoc, north of Belleville, in Hastings county, Ontario. The Gillespie mill at Madoc station has been in operation for the past sixteen years, and produces a superfine, white talc that is much in demand by the talcum powder, textile, paper, soap and rubber trades. Two other mills in the same district have been in intermittent operation for the past ten years.

According to the statistics of production given on page 13, the production of talc in Canada in 1920 amounted to 21,000 tons, valued at $167,000, virtually the whole of this quantity was derived from the Madoc area, Ontario.

OIL CLAIMS AT FORT NORMAN ABANDONED EXCEPT IMPERIAL'S

M. Y. Williams, professor of geology at the University of British Columbia, who has been in the Fort Norman district for the past five months in the interest of the Canadian Geological Survey, reports that, with the exception of work that is being done by the Imperial Oil Company, all oil exploration work in the district has been abandoned, and the majority of the claims have been allowed to lapse. This is attributed to the high rental of fifty cents per acre, many of the stakers having leased as much as four square miles, which calls for an annual rental of $1,200, and the high cost of labor and supplies. Even the Fort Norman Syndicate, which struck a strong flow of gas at 1,500 feet, has abandoned operations. The imperial company is continuing drilling in all its wells, and is producing and refining oil for its own use and is selling small quantities. As Professor Williams came out he met a crew of expert oil drillers going in to work for the Imperial Oil Company. These men will winter in the north, in order to commence operations at the earliest possible date in the spring.

The McCormick Manufacturing Co., Ltd., London, Ont., well-known manufacturers of cereal products, are greatly increasing their laboratory facilities, and propose to put all processes under chemical control.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Ammonia.—I. W. Cederberg, Can. 223453, Sept. 5, 1922. A mixture of H and N is passed in contact with a catalyst comprising a metal of the Fe group and a cyanide of an alkali metal, but not including the decomposition product of a complex cyanide of Fe and an alkal metal.

Electrolytic Treatment of Ores Containing Zinc, Cadmium and Copper.—D. Avery, R. H. Stevens and R. T. D. Williams, 223451.

Treatment of complex Sulphide Ores.—W. G. Perkins, 223422, Sept. 5, 1922.

Chlorination of Cellulose Lyes.—A. Schmid, 222,839, Aug. 22, 1922.

Reduction of Ores.—C. G. Collins, 222732, Aug. 15, 1922.

Treatment of Sulphide and Oxidized Ores.—H. J. E. Hamilton, 220917, July 18, 1922.

Reclaiming By-Products from Waste Sulfite Liquor.—P. A. Paulson, 221600 Aug. 1, 1922. Waste sulfite liquor is heated under pressure to precipitate lignin and other resinous material which is burned in a steam generator; the steam produced is used to heat the waste liquor and with the SO_2 produced to cook the pulp under pressure in a digester. Apparatus is also specified.

Catalyst for the Production of Acetone.—E. G. Thorin, 222919, Aug. 22, 1922. Melted Al is slowly cooled down under stirring so as to granulate it into small pieces with a rough porous surface. The granules are boiled with a solution of catalytic substance and because covered with a layer thereof.

The Extraction of Proteids and Lactose from Whey.—D. Thomson, 222854, Aug. 22, 1922.

Production of Mixtures of Nitrogen and Hydrogen.—B. F. Halvorsen, 223011, Aug. 22, 1922. A sulphide is reacted upon with water at a raised temperature to produce a mixture of H and SO_2; another portion of sulphide is roasted with air to produce a mixture of SO_2 and N and the SO_2 is removed from the gas mixtures by absorption. The first gas mixture may be treated with lime to obtain H and the latter with NH_3 to produce $(NH_4)_2S$ which is used to remove the rest of the O from the mixt.

Treating Sulphide Ores.—C. Malsch and C. H. Gilson, 221675, Aug. 1, 1922.

Smelting Ores, Slags and the Like Containing Iron and Zinc.—L. H. Diehl, 223074, Aug. 29, 1922.

Manufacture of Hydrogen and Oxygen.—F. G. Clark, 223021, Aug. 22, 1922.

Uniting a Metal with Aluminum.—O. F. Reinhold, 223381, Sept. 5, 1922. A metal is united to Al or an Al alloy by applying the metal to the Al or alloy in the presence of an amido-substitution compound of meta-carbonic acid (urea) and heat.

Filaments for Incandescent Lamps.—F. Baumann, Can., 223209, Aug. 29, 1922.

Separation of Metals from Complex Ores.—A. Schwarz, 222661, Aug. 15, 1922.

Iron and Steel.—E. Riveroll, 222717, Aug. 15, 1921. Fe ore is subjected to the action of a reducing and carbonizing gas at a temperature to reduce a portion of the Fe to sponge Fe in a carburized condition and the mixture is then further heated to cause the reduction of the un-reduced portion by reaction with the carburized sponge and the fusion of the resulting metallic Fe.

Process of Treating Ore.—C. G. Collins, 222733, Aug. 15, 1922.

Treating Commercial Calcium Carbide.—L. Janowszky, 223741, Sept. 19, 1922. The water is removed from water glass and the resulting powder is mixed with fatty matter, this mixture is then used to treat CaC_2 to render the latter air proof.

Chloridizing Apparatus.—E. W. Wescott, 223857, Sept. 19, 1922.

Processes of Utilizing Arsenious By-Products.—E. W. Wescott, 223858, Sept. 19, 1922. As ores or speisses are chlorinated, the $AsCl_3$ produced is mixed with a limited amount of water, the solid As_2O_3 formed by hydrolysis is removed and the mother liquor chlorinated to produce arsenic acid, the liquid may then be neutralized to produce arsenates.

Purifying Arsenious Chlorid.—E. W. Wescott, 223859, Sept. 19, 1922. $AsCl_3$ gases produced by treating arsenid ores with Cl are cooled to a temperature near, but above the liquefying point of $AsCl_3$, $FeCl_3$ and dust are removed, the gases further cooled to liquefy $AsCl_3$ which are washed with Aqueous HCl to remove Fe and S; the $AsCl_3$ is heated with As_2O_3 and finally redisdilled.

Treating Ores.—E. W. Wescott, 223860, Sept. 19, 1922. Arsenic ores and speisses to be subjected to chlorination are given a preliminary treatment with HCl.

Treatment of Sulphide Ores Containing Lead and Zinc.—P. A. MacKay, 223940, Sept. 19, 1922. Crushed sulphide ores containing Pb and Zn are treated with H_2SO_4 containing free SO_3 in solution thus initiating an exothermic reaction providing all the heat necessary for the operation, and the $PbSO_4$ formed is separated from the ZnS.

Catalytic Re-Actions Between a Gas and Another Substance.—E. Slatineanu, 223945, Sept. 19, 1922.

Ammonium Chloride and Sodium Carbonate.—G. Claude, 223949, Sept. 19, 1922. A gas containing H CO and CO_2 is prepared from C and H_2O and separated; the H is combined with the N of the air to form NH_3 which is caused to react with CO_2 and NaCl and the NH_4°Cl is separated from the $NaHCO_3$ whichi s decomposed by heat.

Effecting Exothermic Chemical Synthesis.—G. Claude, 223950, Sept. 19, 1922.

Synthesis of Ammonia at High Pressure.—G. Claude, 223951, Sept. 19, 1922. A compressed mixture of N and H is heated by the heat of the reaction of the gases, then passed over a catalytic material and circulated by difference in density so that a part of the mixture after reaction descends to a cooler region where NH_3 is liquefied and separated, the ascending gas freed from NH_3 is heated by indirect contact with the descending gas and mixed with a fresh portion of gas, and again passed through the catalyzer. Apparatus is specified.

Conversion of Synthetic Ammonia Into Solid Ammonium Chloride in Conjunction with the Production of Carbonate of Soda.—G. Claude, 223952, Sept. 19, 1922 The mother liquor from which $NaHCO_3$ has been precipitated by NH_3, CO_2 and NaCl is treated with the quantity of NaCl which remains dissolved during the process, NH_3 and sufficient CO_2 to convert the salt into Na_2CO_3. The solution is cooled to precipitate NH_4Cl which is removed and the solution heated and treated with NaCl and CO_2 to precipitate $NaHCO_3$. The cycle is again repeated.

Synthesis of Ammonia by Hyperpressures.—G. Claude, 223954, Sept. 19, 1922. The gases are caused to react in a chamber the walls of which will withstand the high pressure and temperature and will convey the heat evolved by the reaction with a minimum drop in temperature to a heat-absorbing medium.

Synthesis of Ammonia by Hyperpressures.—G. Claude, 223956, Sept. 19, 1922. The heat generated by the reaction of H and N at high pressure is eliminated while preventing any substantial passage of heat from the interior to the exterior of the reaction chamber.

INDUSTRIAL DEVELOPMENTS

Shawinigan Falls, Que.—During December, operations at the plant of the Northern Aluminum Company, Limited, were largely increased and the plant is now operating at practically normal capacity.

Toronto, Ont.—The Flint Varnish & Color Co. of Canada, Limited, have erected a plant here for the manufacture of metal lacquers, bronzing liquids, split leather solutions and water-proof belting cements.

During the past year the Jefferson Glass Co. have added considerable new equipment to their plant, and have also added a new cased glass to their products for commercial lighting requirements.

Cornwall, Ont.—The Howard Smith Paper Mills, Limited, will next April commence the erection of a new plant for the manufacture of bleached soda pulp which will have a daily output of from thirty to forty tons.

Sherbrooke, Que.—The Manganese and Steel Foundry, Limited, have now a plant in operation with an output of from eight to ten tons of manganese and mild steel castings a week, employing fifteen hands. Mr. P. McCullough is president, and Mr. A. S. Bayles, secretary.

Shawinigan Falls, Que.—Two new paper machines are being installed at the plant of the Belgo Paper Company, which are expected to be in operation shortly. The new machines will increase newsprint production from 63,000 to 105,000 tons per annum.

Hamilton, Ont.—The Burlington Steel Co., Limited, is completing the erection of a large warehouse for the carrying of a large stock of round, square, and square twisted reinforcing bars, properly fabricated to engineers' specifications.

Sydney, N.S.—The Dominion Iron and Steel Co., Ltd., are installing a new galvanizing unit in their wire mill at a cost of $50,000, increasing the daily output of the wire plant from 60 to 120 tons owing to the increasing demand for galvanized wire for nails and fencing.

Toronto, Ont.—Delaney & Pettit, Limited, who recently commenced the manufacture of sand, garnet, flint and emery abrasive papers, hope at an early date to have this made-in-Canada line complete. There is only one other company making similar products in Canada.

New Glasgow, N.S.—Operators on the Malagash properties have located, at a depth of 200 feet, a six-foot face of almost pure white salt, which is reported to analyze 99.1% pure. The engineers in charge state that there is an almost inexhaustible supply of the salt.

Port Arthur, Ont.—Paper making machines and equipment are being installed in the new plants of the Provincial Paper Mills, Limited, at Port Arthur, and the Fort William Paper Co. The Provincial Co. is installing a 40-ton per day book-print mill, and the Fort William Co. two newsprint machines. Sixty-five railway cars were required to handle the shipment of machinery for these new mills.

St. Johns, Newfoundland.—Subject to ratification by the Newfoundland legislature, the Premier of Newfoundland has concluded an agreement between Reid Newfoundland Co., Armstrong-Whitworth, Ltd., the Newfoundland Government and the Imperial Government, the outcome of which is expected to be the erection of a pulp and paper plant in Newfoundland to cost $18,000,000, which will outrival the famous mills of the late Lord Northcliffe.

Sudbury, Ont.—For the first time in four years the entire matte production of the Mond Nickel Company is being shipped out. On November 13th, a shipment of 138 cars of matte, totalling in the neighborhood of 5,600 tons, was sent to the seaboard for export to Wales, this being one car in excess of the October shipments. In September 140 cars were sent out.

Sydney, Nova Scotia.—The total motor fuel output of the British Empire Steel Corporation's steel plant here, will in future be sold direct to the Imperial Oil Company, it was announced at Corporation headquarters. This motor fuel, a form of benzol known locally as bengas, has hitherto been sold direct to filling stations and other retailers, and the production at present amounts to above 60,000 gallons a month.

NORTHERN ONTARIO NOTES

Kirkland Lake District

The Kirkland Lake properties of Continental Mines, Limited, contain a rich gold-bearing vein 100 feet long by 5 feet wide, and is a part of a vein of 40 feet width carrying gold bearing quartz stungers for the entire distance. The gold value is estimated at eight dollars ($8.00) to the ton, which points toward richer and larger ore bodies at depth. The management has decided to commence shaft-sinking immediately.

Word has been received from Kirland Lake that a well has been decided on and will be erected to handle 200 tons of gold ore per day. The high grade ore value is estimated at thirty dollars ($30.00) in gold per ton, situated in the bottom level. This ore contains less copper than that of the upper levels, which caused trouble in contraction.

Kirkland Lake Gold Mines are developing good ore on the 1,000 feet level, and prospects for the future at this mine are very bright.

Wright-Hargreaves Kirlkand Lake Mines have cut into the continuation of the main gold vein at 850 foot level. Drifting is showing the deposits to be as large and rich as at any of the preceding levels.

The Crown Reserve at Larder Lake are about to deepen the shaft from the present 300 foot level. The ore obtained at the present depth is of average good commercial grade.

Porcupine District

The Hollinger Porcupine Mines are milling 4,400 tons a day with the aid of steam power to compensate for the 15 per cent. reduction in electric energy. This is 330 tons above the daily average for the first 45 weeks of the year. The Hollinger were forced to make a power reduction from 9,000 H.P. to 8,100 H.P. by the Northern Canada Power Company. The latter company felt the increased demand for power, and as a consequence had to issue the order. The auxiliary plant in the course of erection by the power company will not be sufficient to meet the heavy demand, according to Mr. Brigham, of Hollinger, who estimates their requirements at 16,000 H.P.

Arrangements have been made for development work on the property of the Porcupine-Davidson Mines, to commence as soon as hydro-electric power is available from the Matachewan Power Company. A new three-compartment shaft and a 500-ton mill have been planned for by Col. Fielding, the consulting engineer.

Coniagas Mines, Limited, will operate the Beaver Consolidated Mines, the Badger and the Prince Davis, all in the Coleman Township, Cobalt Camp.

Coniagas will supply all funds to put Beaver plant and mill in efficient running order.

Nipissing District

Goudreau Gold Mines will operate to a depth of 400 feet. Better ore has been found at the 200-foot level than on the surface, and prospects are for an improvement at the new depth.

NEW HYDROGENATION PLANT

The Harris Abattoir Co., Ltd., Toronto, have added a hydrogenation plant to their well-equipped packing house facilities. This company manufactures oleomargarine, and will now be in the market with hardened oils for edible purposes as well as for soap, lubricating and tanning industries. The plant is located in a new five-storey building, and will be complete in every detail.

GENERAL PURCHASING AGENT OF LINK-BELT CO. PASSES

The death occurred at his home in Chicago, December 11th, of Fred A. Marsh, purchasing agent of the Link-Belt Company. Mr. Marsh was a member of the Link-Belt organization for over 33 years, and had been for some time a director of the National Association of Purchasing Agents. He was a man of sterling character, and will be remembered by his business acquaintances for his honesty and impartial treatment of sellers. He always bought on merit, and no semblance of graft so frequently used by salesmen in not a few lines, was ever tolerated by him.

NEW SALES MANAGER FOR WAMESIT CO.

H. H. Replogle has resigned as manager of The Intermediates and Certified Food Color Divisions of the National Aniline & Chemical Company to assume the sales management of the Wamesit Chemical Company, Lowell, Mass., effective January first. The Wamesit Chemical Company are the largest domestic manufacturers in the world of lactic acid, lactates, lactart, and lactic acid compounds.

The growth and development of The Intermediates and Certified Food Colors business of the National has been entirely supervised by Mr. Replogle, and built up on the basis of quality and service.

KATALITE—A NEW GASOLINE "BOOSTER'

Katalite is the product of Dr. Sokal, consulting chemist to General Motors, Ltd. It is made up as an enamel and baked into the cylinder-head of any internal combustion engine. It is presumed to be effective because of certain elements present of the Cerium Zirconium Group of rare earths. This arrangement, when properly done, aids in complete combustion, and in this way stops many troubles with ordinary gas in standard cars. The cataylst lasts with the life of the engine, and the whole idea is said to be quite a distinct advance. The Katalite Co., Ltd., have Canadian offices at 67 Richmond St. West, Toronto, Ont.

NEW CHEMICAL HOUSE ESTABLISHED

The Chemical Importing Co. have taken offices at 103 Bay St., Toronto. The principals in this business are Mr. C. W. Hess, formerly superintendent of the Flint Varnish and Color Co., and previously with Berry Bros., Inc., and Mr. Bruce Ross, formerly sales manager of the Sun Co.

They propose to carry on a general importing and exporting business in the chemical field. They list heavy chemicals, petroleum products, varnish gums, dry colors and pigments.

The officers of the new company feel that there is a distinct opportunity along many lines whereby Canadian manufacturers can be served by direct importation from actual producers in various foreign fields.

OUTPUT OF IRON AND STEEL IN CANADA NOVEMBER, 1922

Statistic reports of the Dominion Bureau of Statistics show that Canada produced 34,289 tons of pig iron in November, compared with 36,888 tons in October and 31,288 tons, the monthly average for the first eleven months of the year. Last year's monthly average amounted to 50,673 tons.

The production of basic iron for November amounted to 26,156 tons, compared with 28,922 tons for October. The output of foundry iron was 8,133 tons, almost double the production of the preceding month.

1,502 tons of ferro-silicon was produced during the month, a decline of 300 tons from the October record.

The furnaces at Sydney, Sault Ste. Marie and Hamilton were active, the number of blasts remaining the same as in October.

Steel production for October and November amounted to 52,735 tons and 51,418 tons respectively. The latter exceeding the monthly average for the ten months of the year by 12,661 tons. The total production for the first eleven months of the year shows a decline of 185,843 tons, compared with the output for the same period in 1921.

The putput of steel ingots for the month amounted to 48,821 tons, compared with 50,851 tons for October. 2,597 tons of direct steel castings were produced, an increase of 755 tons over the previous month's production, and greater than any month's production since January 1921. The total production of castings for the first eleven months of the year amounted to 19,331 tons, compared with 20,858 tons during the corresponding period last year.

CANADIAN CHEMICAL MARKET.

Canadian chemical manufacturers and dealers enter 1923 with every prospect for better business as regards production, volume of business, and the margin of profit on operations. Contrasting conditions now with those prevailing at the beginning of 1922, the one outstanding feature of the market is the greater stability to prices now obtaining. During the first six months of 1922 there was let loose an era of price cutting that was very detrimental to constructive business. Many dealers suffering from the effects of the depression of 1921 adopted the attitude, "Any price to get the order," and the natural result was that nobody made any money or made very much headway toward getting back to normal business. The change toward better conditions came slowly, it did not come overnight, and the fight is still an up-hill one, but the good feature of the whole market now is that price cutting has largely ceased, and demand from the consuming industries is improving steadily.

Take it on the whole, production of chemical products increased about 50 per cent. during 1922 over 1921. The increased activity in the textile, iron and steel, leather, petroleum and other of the consuming industries, created a natural increased demand for chemicals. At the present time the textile mills are very busy and there is a good trade being done by chemical manufacturers and dealers with the textile industry. The same is true of the leather industry. Mr. K. D. Marlatt, retiring chairman of the Tanners' Branch of the Canadian Manufacturers' Association, announces that if the brisk business conditions are maintained. the tanneries may have some difficulty in supplying the full quantity of leather necessary for the spring trade. The paint and varnish industry became steadily busier during 1922 and there is now at the opening of 1923 a very fair demand for chemicals, gums and oils from paint and varnish works. A similar revival in demand has occurred from the rubber industry, and about the only consuming trade that hasn't increased its demands in as good a proportion as those mentioned insofar as Canadian trade goes, is the iron and steel. But even in the iron and steel activity is much better and demand from Canadian mills shows every prospect of becoming steadily larger this year.

As mentioned above, prices are much more stable. Even during December improvement was noted towards greater stability of quotations, especially in the heavy chemicals. Probably the greatest improvement that has occurred this winter, so far, in the Canadian chemical industry, has been in the wood distillate and carbide industry. There has been a marked increase in the demand for acetic acid, acetone, denatured alcohols, and formaldehyde.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals and Industrial Minerals.

Inorganic.

Alum, Ammonia, lump or ground	100 Lbs.	4.50— 5.00
Ammonium Bromide	Lb.	.. — .22
Aluminum Sulphate, lump, bags	Cwt.	2.25— 2.50
Aluminum Sulphate, ground, bags	Cwt.	2.50— 2.75
Aluminium Sulphate, iron free	Cwt.	.. — 4.00
Ammonia, Aqua, 26, Carboys	Lb.	.. — .12
Ammonia, Aqua, 26, Drums	Lb.	.. —.09½
Ammonium Carbonate	Lb.	.12— .15
Ammonium Chloride	Lb.	.08— .11
Ammonia Iodide	Lb.	.. — 6.25
Arsenic	Lb	.10— .12
Barium Sulphate (Barytes)	Pre Ton	30.00—35.00
Barium Chloride	Lb.	.05— .07
Barium Nitrate	Lb.	.. — .16
Barium Peroxide	Lb	.. — .21
Barium Sulphate, B.P.	Per Ton	60.00—60.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	Lb.	2.50— 3.00
Borax, crystals	Lb.	.07—.07¼
Boric Acid	Lb.	.. — .13
Bromine (technical)	Lb.	.. — .38
Calcium Acid Phosphate	Lb.	.. —.07½
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —95.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	..—100.00
Calcium Chloride, fused	Per Ton	.. —25.00
Calcium Chloride, flake	Ton	40.00—42.00
Caustic Soda, ground, drum	Cwt.	5.00— 5.50
Caustic Soda, solid, drum	Cwt.	4.25— 4.75
Camphor Monobromate	Lb	.. — 3.00
Carbon Bisulphide, in drums	Lb.	.11— .12
Carbon Tetrachloride, drums	Lb.	.. — .15
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, Canadian, f.o.b. Huberdeau, Que., car lots	Ton	17.00—18.00
China Clay, imported	Per Ton	20.00—25.00
Cobalt Oxide, black	Lb.	.. — 2.00
Cobalt Oxide, grey	Lb	.. — 2.25
Copperas (Iron Sulphate) crystals	Lb.	.02—.02¼
Copperas (Iron Sulphate) sugar	Lb.	.02—.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.08—.08¼
Corrosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.10
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	.. —30.00
Ferric Chloride, crystals	Lb.	.11— .12
Ferric Chloride, solution	Lb.	.. — .10
Hydrofluoric Acid, 60%	Lb.	.25— .28
Hydrofluoric Acid. 30%	Lb.	.12— .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.25— 2.75
Hydrogen Peroxide	Gal.	.70— .75
Iodine, crude	Lb.	.. — 4.50
Iodine, resublimed	Lb.	.. — 5.25
Iron Oxide (red)	Lb	.05— .13
Lead Acetate	Lb.	.14— .16
Lead Nitrate	Lb.	.14 — .15
Lime, grey	Ton	.. —14.30
Lime, grey, in car lots	Ton	.. —11.70
Lime (hydrated) in ton lots	Ton	.. —20.00
Litharge	Lb.	.09— .10
Lithium Carbonate	Lb.	1.75— 2.10
Lithopone	Lb.	.08— .09
Magnesite, calcined	Per Ton	.. —30.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.12— .13
Magnesium Sulphate	Lb.	.03½—.04½
Mag. Sulphate, B.P., Medicinal	Single Ton	60.00—70.00
Mag. Sulphate, Technical, car lots	Ton	45.00—50.00
Mica, ground, f.o.b. Hull, Que.	Ton	.. —60.00
Muriatic Acid, 18	100 Lbs.	2.25— 2.75
Nickel Salt, single, in bbl. lots	Lb.	.. — .15
Nickel Salt, single, per cwt.	Cwt.	.. —.16½
Nickel Salt, double, barrel lots	Lb	.. — .15
Nickel Salt, double, per cwt.	Lb.	.. —.16½
Nitric Acid, 36 carboys	100 Lbs.	8.75— 9.00
Phosphoric Acid, 85%	Lb.	.. — .28
Phosphoric Acid, 50%	Lb.	.. — .22
Phosphorus, yellow	Lb.	.. — .34
Potash Prussiate, yellow	Lb.	.28— .30
Potassium Bicarbonate	Lb.	.. — .20
Potassium Bromide, crystals	Lb.	.22— .30
Potassium Bromide, granular	Lb.	.22— .30
Potassium Bichromate	Lb.	.17— .18
Potassium Carbonate, calc. 80%-85%	Lb.	.. — .09
Potassium Chlorate	Lb.	.. — .10
Potassium Citrate	Lb.	.90— 1.00
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .45
Potassium Hydroxide (caustic potash) small drums.	Lb.	.10— .15
Potassium Hydroxide (caustic potash) large drums.	Lb.	.07— .08
Potassium Iodide	Lb	.. — 4.40
Potassium Nitrate, casks	Lb.	.10— .12
Potassium Permanganate, bulk	Lb.	.19— .20
Red Precipitate (Mercuric Oxide)	Lb.	.. — 1.50
Silver Nitrate	Lb.	.. — 9.00
Soda Ash, bags	Cwt.	2.25— 2.40
Sodium Acetate, ton lots or over	Lb.	.. — .08
Sodium Acetate, lesser amounts	Lb.	.. —.08½
Sodium Aluminium Phosphate	Lb.	.. —.03½
Sodium Benzoate	Lb.	.75— .80
Sodium Bicarbonate, 100% pure	Lb.	2.50— 3.00
Sodium Bichromate, bbls.	Lb.	.10— .13
Sodium Bisulphite, powder	Lb.	.05¼— .06
Sodium Bisulphite, 35 Be.	Lb.	.03—.03¼
Sodium Bromide (foreign)	Lb.	.. — .24
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. — .31
Sodium Fluoride, 95-98%	Lb.	.15— .16
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.00
Sodium Hyposulphite, barrels	Cwt.	4.00— 4.50
Sodium Iodide	Lb.	.. — 4.90
Sodium Nitrate, refined	Cwt.	6.75— 7.00
Sodium Nitrate, crude, 95%	Cwt.	5.25— 5.75
Sodium Nitrite	Lb	.12— .15
Sodium Perborate, U.S.P.	Lb.	.35— .40
Sodium Peroxide, f.o.b. New York	Lb.	.30— .35
Sodium Silicate, 42°, car lots	Cwt.	.. — 1.35
Sodium Silicate, 42°, smaller lots	Cwt.	.. — 1.55
Sodium Silicate, 40°, car lots	Cwt.	.. — 1.25
Sodium Silicate, 40°, smaller lots	Cwt.	.. — 1.45
Sodium Sulphide, 60-62% fused	Lb.	.08— .09
Sodium Sulphate (Glauber's Salts) crystals,	Per Cwt. in Bags	1.80— 2.00
	Per Cwt. in Car Lots	1.65— 1.70
Sodium Sulphite	Lb.	.. — .05
Sodium Prussiate, Yellow	Lb	.24— .25
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.25— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.25— 2.75
Sulphuric Acid, 66 Be, tank cars, f.o.b. Toronto,	Ton	23.75—24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —23.00
Tin Chloride crystals	Lb.	.30— .35
Tri-sodium Phosphate	Lb.	.07—.07½
Ultramarine, Blue	Lb.	.10— .29
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 1.60
Whiting (English)	Ton	.. —30.00
Whiting (American)	Ton	.. —30.00
Zinc Sulphate, com.	Lb.	.04—.04½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.09— .10
Zinc Stearerate	Lb.	.25— .30

Organic.

Acetanilid, C. P.	Lb.	.45— .50
Acetic Acid, glacial, carboys, f.o.b. Shawinigan Falls	Lb.	.. —.20½
Acetic Acid, glacial, carboys, car lots, f.o.b. Shawinigan	Lb.	.. —.16½
Acetic Acid, glacial, bbls., car lots, fo.b. Shawinigan,	Lb.	.. — .16
Acetic Acid, 28%, carload lots	100 Lb.	.. — 4.80
Acetic Acid, 28%, 25 bbl. lots	100 Lb	.. — 5.05
Acetic Acid, 28%, 10 bbl. lots	100 Lb.	.. — 5.30
Acetic Acid, 28%, 5 bbl. lots	100 Lb.	.. — 5.55
Acetic Acid, 28%, 1 or 2 bbl. lots	100 Lb.	.. — 5.80
Acetic Acid, 80%, carload lots	100 Lb.	.. —13.20
Acetic Acid, 80%, 25 bbl. lots	100 Lb.	.. —15.20
Acetic Acid, 80%, 15 bbl. lots	100 Lb.	.. —16.20
Acetic Acid, 80%, 10 bbl. lots	100 Lb.	.. —16.75
Acetic Acid, 80%, 5 bbl. lots	100 Lb.	.. —17.20
Acetic Acid, 80%, 3 or 4 bbl. lots	100 Lb.	.. —18.20
Acetic Acid, 80%, 1 or 2 bbl. lots	100 Lb.	.. —18.50
Acetone, pure, drums or over	Lb.	.. — .27
Acetone, pure, lesser amounts	Lb.	.. — .34
Aspirin, in 100-lb. lots	Lb.	.90— 1.00
Alcohol, Absolute Ethyl, case of 1 doz....1-lb. bottle		.. — 3.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —23.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.15
Alcohol, acetone, lesser amounts	Gal.	.. — 1.45
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.20
Alcohol, wood, 97%, half bbl. lots	Gal.	.. — 1.35
Alcohol, wood, 97%, lesser amonnts	Gal.	.. — 1.50
Aldehyde Ammonia	Lb.	.. — .75
Amyl acetate, technical	Gal.	4.50— 5.00
Amyl Acetate, pure	Lb.	.. — .80
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.85 — .90
Caffeine, English	Lb.	.. — 3.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.25
Camphor, refined, slabs	Lb.	.. — 1.25
Camphor, refined, tal	Lb.	.. — .98
Carbolic Acid, white crystals	Lb.	.25— .30
Chloroform	Lb.	.40— .50
Citric Acid, domestic, crystals	Lb.	.50— .60
Coumarin	Lb.	3.00— 3.50
Cream Tartar, 98%	Lb.	.25— .30
Dextrine, potato	Lb.	.. — .06
Dextrine, corn	Lb.	.. —.08½
Ether, B.P. (conc.)	Lb.	.. — .55
Ether, Sulphuric	Lb.	.28— .38
Formaldehyde, bbls. or over	Lb.	.. —.19½
Formaldehyde, 200-lb. kegs	Lb	.. —.24½
Formaldehyde, 100-lb. kegs	Lb.	.. —.25½
Formaldehyde, 50-lb. kegs	Lb.	.. —.26½
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	.. — 6.00
Gallic Acid	Lb.	1.25— 1.75
Glycerine, crude, single tin of 56 lbs.	Lb.	.. — .17
Glycerine, crude, two or more tins	Lb.	.. — .15
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .29
Glycerine, C.P., two or more tins	Lb.	.. — .27
Glycerine, (pale straw), single tin 56 lbs.	Lb.	.. — .28
Glycertine, (pale straw), two or more tins	Lb.	.. — .26

Glycerine, C.P. drums, 500-1,000 lbs.	Lb.	.21
Glycerine, pale straw, drums, 500-1,000 lbs.	Lb.	.20
Hexamethylenetetramine		.90
Oxalic Acid	Lb.	.18—.20
Oleic Acid	Lb.	.28—.28
Phenacetin	Lb.	2.00—2.25
Phenolphthalein	Lb.	1.50
Pyrogallic Acid	Lb.	2.00—2.10
Quinine	Oz.	.55—.60
Saccharin	Lb.	2.25—2.75
Salicylic Acid	Lb.	.50
Starch, corn, ground, car lots	Lb.	—.04¼
Starch, potato, ground, car lots	Lb.	—.08½
Stearic Acid, Double Pressed	Lb.	.18—.19
Stearic Acid, Triple Pressed	Lb.	.19—.21
Tartaric Acid, crystals or powdered	Lb.	.38
Tannic Acid, commercial	Lb.	.45—.65

C. P. Chemicals.

Ammonia, C.P.	Lb.	.22
Hydrochloric Acid, C.P.	Lb.	.14
Nitric Acid, C.P.	Lb.	.22
Sulphuric Acid, C.P.	Lb.	.13

Industrial Gases.

Acetylene, cylinders	per 100 cu. ft.	2.55—3.00
Coal Gas, cylinders	per 100 cu. ft.	3.00—4.00
Hydrogen, cylinders	per 100 cu. ft.	1.50—2.00
Nitrogen, cylinders	per 100 cu. ft.	2.00—3.00
Oxygen, cylinders	per 100 cu. ft.	1.50—2.00

Fertilizer Materials.

Acid Phosphate	Ton	20.00—22.00
Animal Tankage, per unit of Ammonia		2.65
Animal Tankage, per unit of Bone Phosphate of lime		.10
Nitrate of Soda		—68.00
Muriate of Potash	Ton	—40.00
Pure Ground Blood, per unit of Ammonia		3.00
Steamed Bone Meal	Per Ton	25.00—30.00
Sulphate of Ammonia	Ton	—65.00

Rubber.

The following quotations on rubber are in American funds, New York delivery:

Crude.

Para, upriver	Lb.	.24
Caucho Ball, upriver	Lb.	.12

Plantation Rubber.

1st Latex Crepe	Lb.	17½
Smoked Sheet	Lb.	.17

Scrap Rubber.

Boots and Shoes	Lb.	.03—.04
Automobile Tires	Lb.	.0½
Steam and fire hose	Lb.	—.01¼
Inner tubes, No. 1	Lb	.06
Inner tubes, No. 2	Lb	.03

Tanning and Dyeing Material

Fustic Crystals	Lb.	.28—.32
Hematine Crystals	Lb.	.20—.26
Logwood Crystals	Lb	.20—.30
Quercitron Liquid Extract	Lb.	.06¾—.07½
Liquid Sumac Extract	Lb.	.07½—.08½
Ground Sumac	Ton	60.00—65.00
Chestnut Liquid Extract	Lb.	.02¼—.02¾
Hemlock Liquid Extract	Lb.	.04½—.04¾
Quebracho Liquid Extract	Lb	.03¾— .04
Quebracho Solid Extract	Lb.	.05¾—.05¾
Liquid Blended Extract (Canadian)	Lb.	.04—.04½

Waxes, Gums, Vegetable and Essential Oils.

Essential Oils—

Cedar, leaf	Lb.	1.90—2.00
Cedar, wood	Lb.	.80
Camphor	Gal	1.10
Camphor, white	Lb.	.70—.75
Peppermint, American	Lb.	1.80—1.90
Peppermint, re-distilled, B.P.	Lb.	2.10—2.15
Peppermint, Japanese	Lb.	.75—.80

Vegetable Oils—

Anise Oil	Lb.	.80
Castor Oil (Medicinal), in bbl. lots	Lb.	.21
Castor Oil (Commercial), in bbl. lots	Lb.	.19
Castor Oil (Sulphonated)	Lb.	.15—.19
Cocoanut Oil (Refined)	Lb.	.14—.16
Corn Oil, in bbls.	Lb.	.12
Corn Oil, tank cars	Lb.	.10—.10½
Cottonseed Oil, crude, f.o.b. Mississippi Valley points	Lb	—.08¼
Cottonseed Oil, crude, f.o.b. Texas points	Lb.	—.08½
Cottonseed Oil, summer yellow, f.o.b. Chicago	Lb.	—.09¾
Cottonseed Oil, winter yellow, f.o.b. N.Y.	Lb.	—.12¼
Linseed Oil, raw, single bbls.	Imp. Gal.	1.06
Linseed Oil, raw, 5-bbl. lots up	Imp. Gal.	1.05
Linseed Oil, boiled, 3c per lb. higher than raw		1.08—1.09
Monopole Oil	Lb.	.07—.16
Olive Oil, foots, at Toronto	Lb.	.12—.14

Gums—

Indian, No. 1A	Lb.	.30
Indian, No. 1	Lb.	.27
Tragacanth, No. 1, Ribbon	Lb.	2.25
Tragacanth, No. 1, Flake	Lb.	1.50
Tragacanth, Turkey	Lb.	1.50
Arabic, clear amber sorts	Lb.	.20
Arabic, regular grain No. 4 and No. 5	Lb.	.26
Arabic, regular grain No. 2	Lb.	.27
Arabic, white sorts	Lb.	.30
Arabic, powdered, No. 1	Lb.	.38
Arabic, powdered, No. 2	Lb.	.37

Waxes—

Paraffin, 128°—130°, M.P., 250 lb. lots	Lb.	.06
Paraffin, 118°—120°, M.P., 250 lb. lots	Lb.	.05
Parowax, blocks, 100 lb. lots	Lb.	—.08¾
Shellac, T.N.	Lb.	.73—.74
Bone Dry Shellac	Lb.	.84—.86

Beeswax.

Crude, dark	Lb.	.28
Crude, light	Lb.	.48
Refined, dark	Lb.	.35
Refined, light	Lb.	.55

Carnauba.

No. 1	Lb.	.50
No. 2	Lb.	.42
No. 3	Lb.	.30
North Country, No. 2	Lb	.32
North Country, No. 3	Lb.	.25
Chalk Grey	Lb.	.23

Ceresin.

White	Lb.	.14
Yellow	Lb.	.13
Montan	Lb.	—.08½
Candelilla	Lb.	.45
Japan	Lb.	.22

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.29
Motor Gasoline (service stations)	Gal.	.33
Lighting Gasoline	Gal.	.34
Naphtha	Gal.	.28
Coal Oil	Gal.	.21
Fuel Oil, tank wagons	Gal.	10.8
Fuel Oil, tank cars	Gal.	9.8
Mid. Continent Crude (42 W. gal.)	Bbl.	1.25
Pennsylvania, Crude (42 W. gal.)	Bbl.	3.00
Crude Creosote Oil, bbls.	Gal.	.40
Refined Creosote Oil, bbls.	Gal.	.60
Crude Coal Tar	Bbl.	—10.25
Refined Coal Tar	Bbl.	—11.50
Coal Tar Pitch, bbls.	Cwt.	2.00
Benzol, 100%	Imp. Gal.	.65
Benzol, 90%	Imp. Gal.	.60
Refined Solvent Naphtha	Gal.	.48
Pure Toluol	Gal.	.52
Dip Oil, 20 per cent. (at New York)	Gal.	.24—.26
Crude Carbolic Acid, 30 per cent.	Gal.	.30
Naphthalin flake	Lb.	.08
Naphthalin balls	Lb.	.09
Alpha-Naphylamin	Lb.	.51

Flotation Oils and Naval Stores.

Rosin, Grade G, in 280 bbl. lots		8.25
Rosin, Grade W.W., in 280 bbl. lots		—10.50
Turpentine, Spirits, 5 bbl. lots up	Imp. Gal.	1.95

Metals.

Aluminium, 98-99%, 15 ton lots	Lb.	—.18¾
Antimony	Lb.	—.06¼
Brass, yellow ingots	Lb.	.11
Brass, red	Lb.	—.13½
Brass, rods	Lb.	.19
Cobalt, metal	Lb.	3.00—3.25
Copper, electrolytic, small lots	Cwt.	—17.00
Copper, electrolytic, car lots	Cwt.	—16.50
Copper, casting, small lots	Cwt.	—16.00
Copper, casting, car lots	Cwt.	—15.50
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	—33.00
Lead, Pig, small lots	Cwt.	— 7.80
Lead, Pig, car lots	Cwt.	— 7.10
Magnesium, ribbon	Oz.	— 1.50
Magnesium, ribbon	Lb.	—18.00
Magnesium, powder	Oz.	.60—.65
Monel Metal, machined rods	Lb.	.50
Monel Blocks	Lb.	.34
Monel Metal, shot	Lb.	.34
Monel Metal, sheet, hot rolled, on orders of over five hundred pounds, of one gauge	Lb.	.48
Monel Metal, rods, hot rolled	Lb.	.42
Monel Metal, rods, cold rolled	Lb.	.53
Nickel, shot or ingot	Lb.	.35
Platinum, pure	Oz.	—124.00
Platinum, 5% iridium	Oz.	—128.00
Platinum, 10% iridium	Oz.	—138.00
Silver, bar, American silver	Oz.	—.99¼
Silver, bar, Canadian produced, U.S. funds	Oz.	—.70⅞
Steel, mild, ¼ inch, base price	Cwt.	3.35
Steel, mild, 3/16 inch, base price	Cwt.	3.85
Steel, nickel, in bars, 3½% nickel	Lb.	.20
Steel, sheet, 28 gauge, size 30"	Cwt.	5.25
Steel, sheet, 28 gauge, size 36"	Cwt.	5.35
Steel, sheets, galvanized, 28 gauge, 30"	Cwt.	6.25
Steel, sheets, galvanized, 28 gauge, 36"	Cwt.	6.45
Tin	Lb.	.40
Zinc, sheets	Lb.	.12—.14
Zinc (spelter) small lots	Cwt.	8.95
Zinc (spelter) car lots	Cwt.	8.45

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Aggregate Value of $734,259,619

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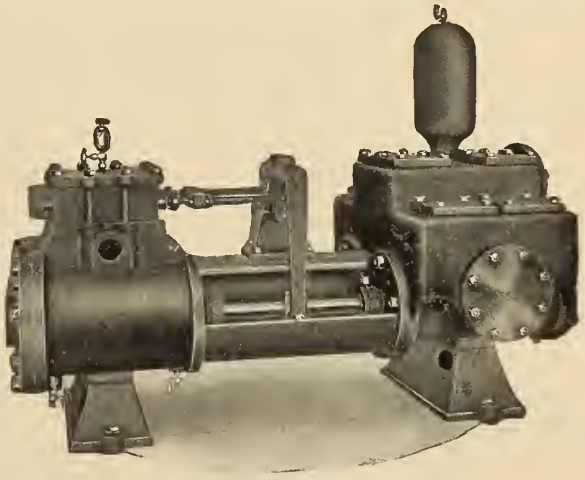

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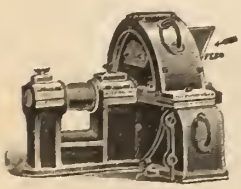
Application forms properly filled in must be filed with the Civil Service Commission, Ottawa, not later than February 10th, 1923. For further particulars, see Position Vacant List on display in Post Offices.

WM. FORAN, Secretary.



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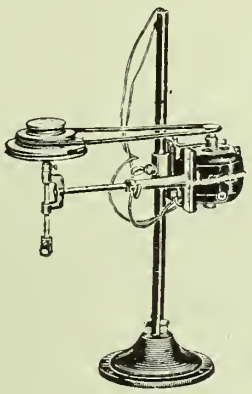

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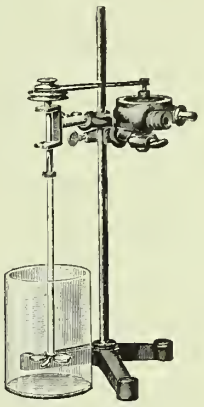

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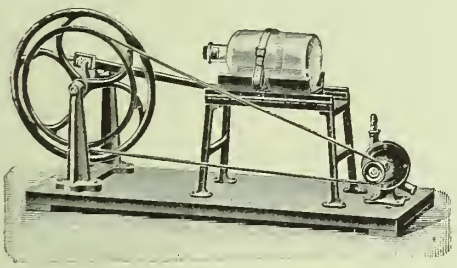

J 3359 B
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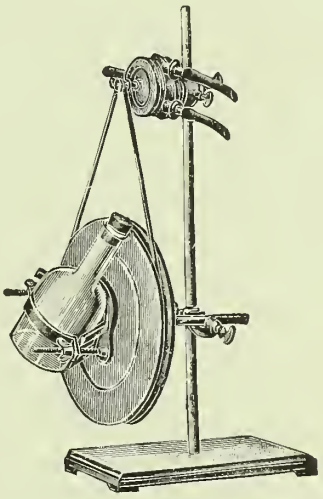

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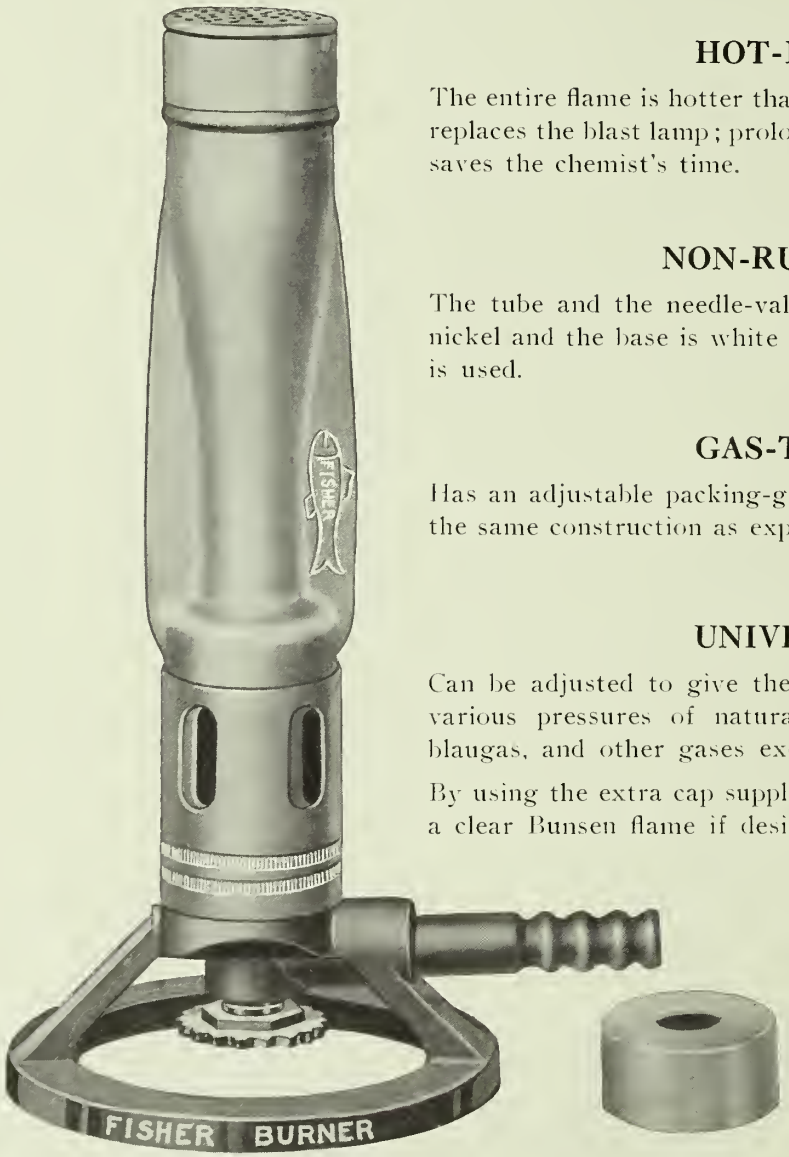

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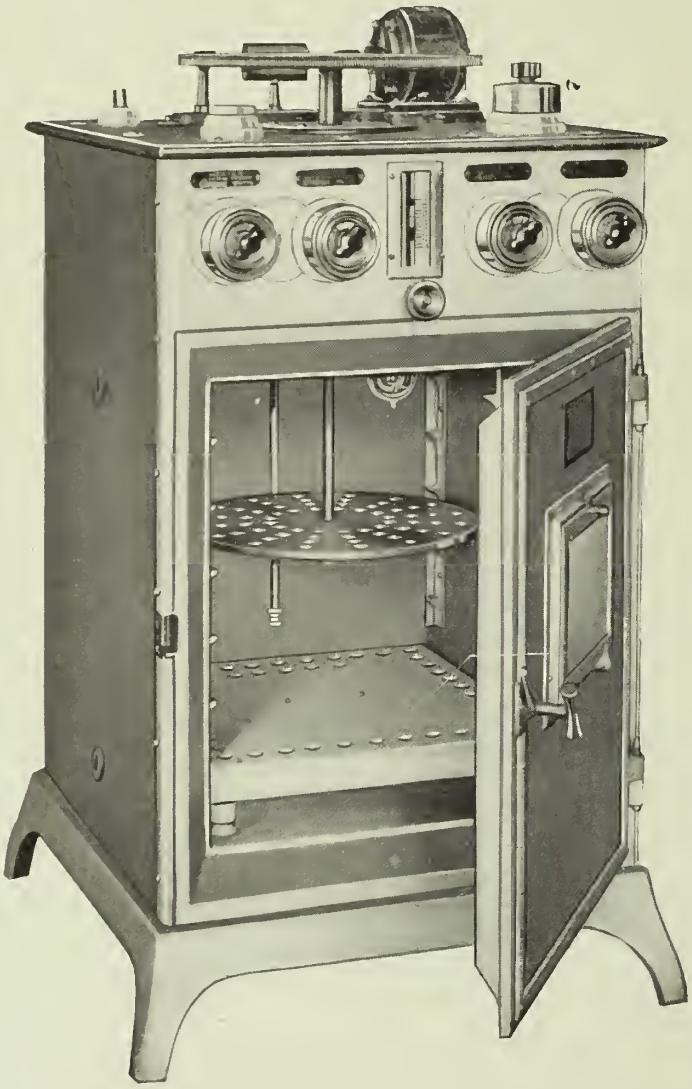

Cut shows the oven with ROTATING SHELF so as to secure highest degree of uniformity of temperature. Interior dimensions are 12″ x 12″ x 12″. Ordinary wiring is for temperatures up to 180° C., though special wiring can be supplied for temperatures up to 260° C. at slight additional cost.

Price of Freas Revolving Shelf Oven, as above, $240.00.

For further information in regard to this oven, also in regard to other forms of Freas Ovens, or with reference to laboratory equipment in general, write to us stating your requirements.

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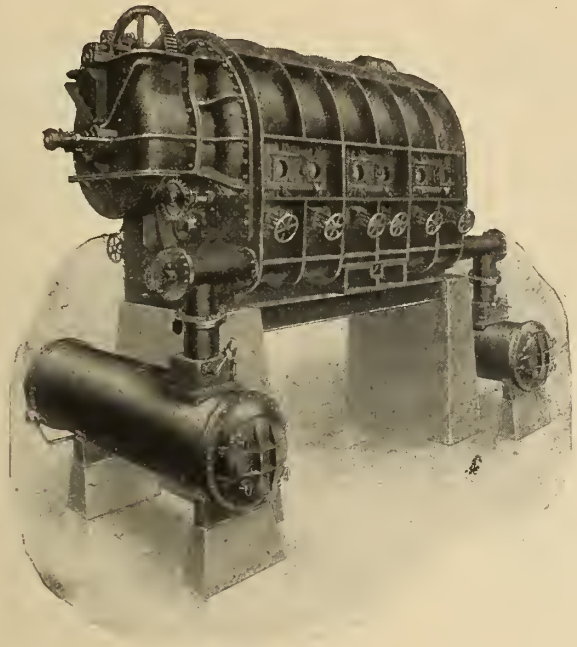

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45o Elbow
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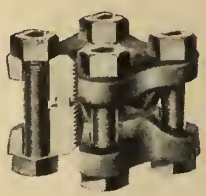
The maximum recommended working pressures are dependent upon the size of fittings.



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38

ONTARIO'S MINERALS

PROVINCE OF ONTARIO
DEPARTMENT OF MINES

Hon. H. Mills, Minister

The following table, subject to revision, summarizes the mineral production of Ontario for 1921. As far as possible the figures represent quantities shipped and values received for marketed products. Tons throughout are short tons of 2,000 pounds. Final figures for 1920 are included for comparison.

Summary of Mineral Statistics, 1921

	Quantity		Value	
Metallic	1920	1921	1920	1921
Gold ..... ounces	565,283	709,509	$11,686,043	$14,624,085
Silver ..... "	11,065,415	8,412,059	10,873,496	5,497,160
Platinum metals ..... "	19,056	(a) 915	1,996,535	51,060
Copper ..... lbs.	6,825,772	3,070,719	1,041,994	356,708
Nickel, metallic ..... "	11,015,692	5,430,147	3,852,141	1,825,359
Nickel, oxide ..... "	4,890,571	1,402,019	1,151,490	285,391
Cobalt, metallic ..... "	167,750	32,718	392,926	98,228
Cobalt, oxide ..... "	569,182	155,554	1,210,810	354,418
Other Nickel and Cobalt compounds ..... "	161,442	108,814	16,991	114,069
Lead, pig ..... "	2,232,253	3,570,222	179,714	190,843
Copper in matte exported (b) ..... tons.	11,715	3,686	2,928,750	737,142
Nickel in matte exported (b) ..... "	21,371	4,850	10,685,500	1,939,851
Iron ore and briquettes (c) ..... "	68,616	100	60,958	459
Iron, pig (d) ..... "	67,164	82,318	2,204,205	2,079,729
Total metallic			$48,281,553	$27,574,202
Non-Metallic				
Actinolite ..... tons.	100	78	$ 1,160	$ 975
Arsenic, crude and white ..... lbs.	3,781,389	2,982,525	432,434	233,763
Clay products—				
Brick, common ..... M.	123,551	99,463	2,209,265	1,743,094
Brick, fancy and pressed ..... "	32,559	31,481	809,126	673,087
Tile, drain ..... "	9,784	9,910	359,373	250,040
Tile, roofing and building ..... tons.	58,737	.....	369,530	211,529
Pottery			127,049	67,985
Sewer pipe			860,811	939,464
Cement, Portland ..... bbls.	2,035,594	2,723,072	4,377,814	6,425,266
Corundum ..... tons.	196	402	27,000	50,250
Feldspar ..... "	37,335	15,506	268,295	114,059
Fluorspar ..... "	3,704	115	67,381	1,744
Graphite, crude and refined ..... "	1,956	363	132,882	23,273
Gypsum, crushed, ground and calcined ..... "	74,707	84,765	404,162	433,053
Iron Pyrites ..... "	148,651	19,375	618,283	91,604
Lime ..... bush.	4,982,912	2,610,129	1,799,763	1,172,680
Mica ..... tons.	717	222	51,394	29,630
Mineral water ..... Imp. gals.	127,150	.....	15,059	9,000
Natural gas ..... M cu. ft.	10,545,000	8,590,000	3,163,500	2,953,000
Peat ..... tons.	3,900	500	15,600	2,000
Petroleum, crude ..... bbls.	181,750	172,859	724,145	466,716
Quartz and silica brick ..... tons.	94,650	12,957	366,441	74,635
Salt ..... "	206,612	149,599	1,544,867	1,509,287
Sand and gravel ..... cu. yds.	2,162,241	1,412,956	1,390,704	668,098
Sand-Lime brick ..... M.	27,703	.....	407,766	456,700
Stone, building, trap, granite, etc			3,944,972	1,812,863
Talc, crude and ground ..... tons.	20,359	9,967	306,319	140,390
Total non-metallic			$24,795,194	$20,554,185
Add metallic			48,281,553	27,574,202
Grand Total			$73,076,747	$48,128,387

(a) Recoveries from Canadian refineries only.

(b) Copper and nickel exports in the form of matte were valued, respectively, at 12½ and 25 cents per pound in 1920, and at 10 and 20 cents in 1921.

(c) Exports and shipments to points other than Ontario blast furnaces.

(d) Proportional product from Ontario ore smelted. Figures cover only the first nine months of 1921.

Dividends and Bonuses paid to the end of 1921 amounted to $23,140,734 for gold mining companies, and $84,388,185 for silver mining companies, or a total of $107,528,919.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

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TO END OF DECEMBER, 1921

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Aggregate Value of $734,259,619

Production for Year Ending December, 1921, $28,066,641

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

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Full information, together with Mining Reports and Maps, may be obtained gratis by addressing—

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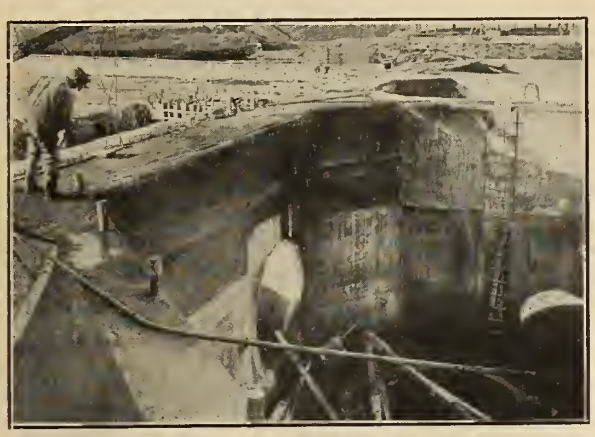
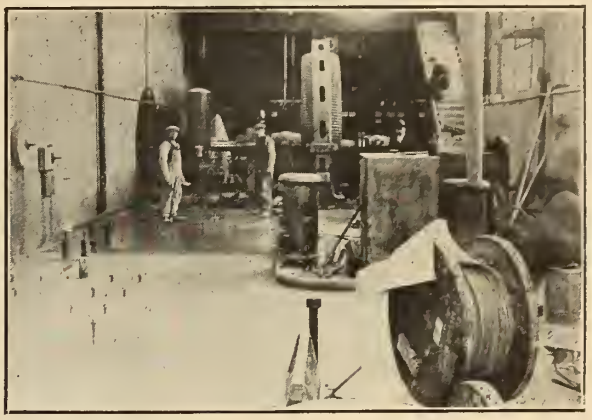
VICTORIA : BRITISH COLUMBIA



Inside of Forebay—upstream face of Breast Wall—for 1600 h.p. unit.



Interior of Power House, showing Breast Wall.

The left wall of the Power House interior is the inside of the Breast Wall which shows in the illustration on the left.

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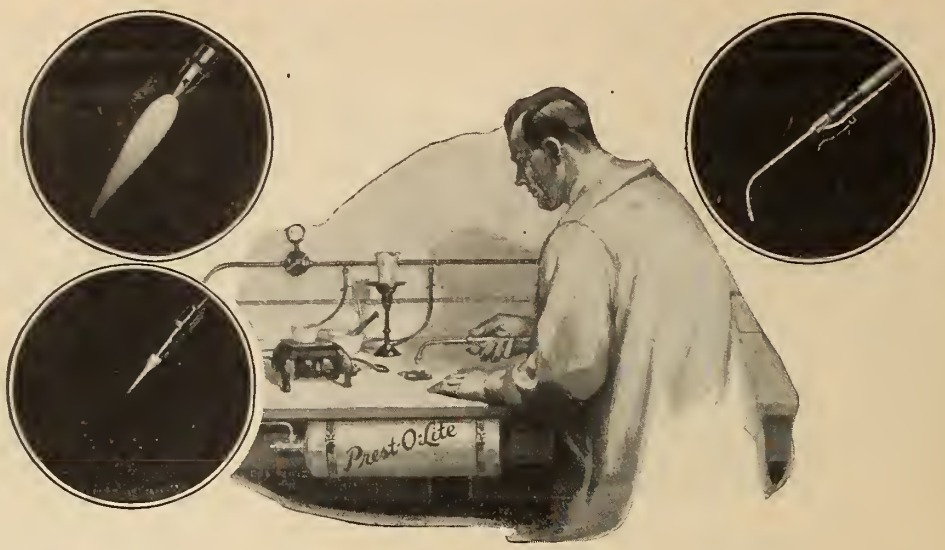

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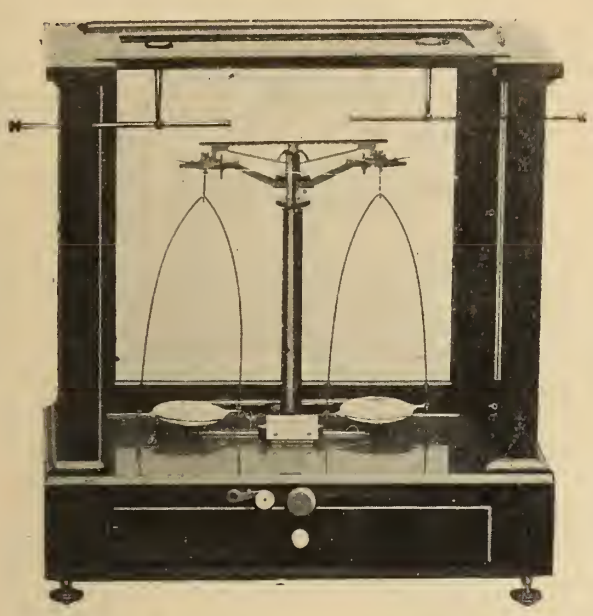

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BALANCE—Becker's Sons (Rotterdam), capacity 200 grams in each pan, sensitive to 1/20 milligram, beam of aluminum, 6″ long, divided on both sides into 1/10 milligram. The rider may be used on either side of beam. The bearings and knives are agate. Mounted on heavy glass plate in glass and mahogany case with glass top and counterpoised door. With riders, specific gravity support, weighing tube support with counterpoise, and key with which the drawer and door may be locked. This is Becker's Standard Analytical Balance **$135.00**

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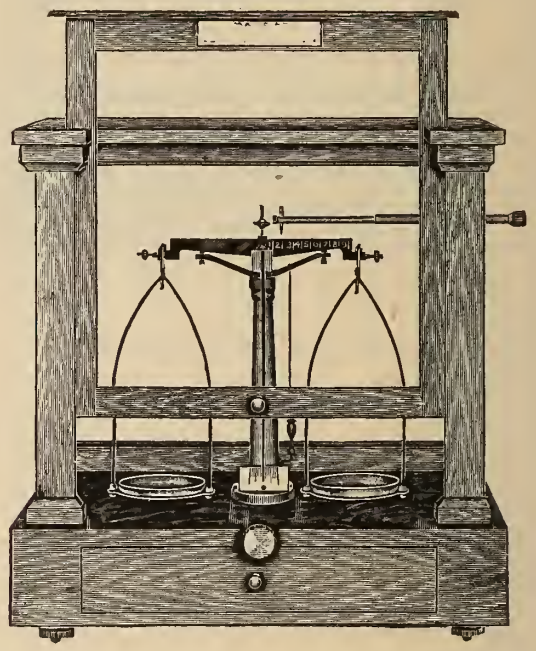

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Denomination	Tolerance	Denomination	Tolerance	Denomination	Tolerance	Denomination	Tolerance
100 grams	± 0.5 mg.	5 grams	± 0.15 mg.	200 mg.	± 0.05 mg.	10 mg.	± 0.03 mg.
50 "	± 0.3 "	2 "	± 0.15 "	100 "	± 0.05 "	5 "	± 0.03 "
20 "	± 0.2 "	1 "	± 0.10 "	50 "	± 0.04 "	2 "	± 0.02 "
100 "	± 0.2 "	500 mg.	± 0.10 "	20 "	± 0.04 "	1 "	± 0.02 "

The weights are supplied in a velvet-lined, polished mahogany box, with fractionals and riders under plate glass cover, and with ivory-tipped forceps. The fractionals from 1 to 20 mg. are of aluminum, and from 50 to 500 mg. are of palladium and gold alloy or platinum, as may be the more readily obtainable. The fractional pieces have one edge turned in a vertical position for convenience in handling with forceps. One each 5 and 10 mg. riders are furnished with each set.

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In thinking this over, we have come to realize that even a small chemical paper has a powerful influence on its readers and a great responsibility to them. This is not visible until that influence has in some way swerved from the true path.

It is impossible for us to be in personal contact with chemical affairs and business activities to the extent we might desire, and we invite all our Canadian readers to assist us to secure the accurate information we must have, if we are to represent Canada properly with a chemical publication.

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EDITORIALS

WHAT AN INDUSTRY TALKS ABOUT

WE listened in at the tenth Annual Meeting of the Canadian Pulp and Paper Association.

It might have been expected that this half-day, the one half-day of the year in an important industry, would be taken up with affairs having to do with prices and statistics. Instead, the bulk of the time was consumed in discussing three proposals, quite outside those spheres of activity.

The first proposal was to set aside $30,000, to appoint a Director of Research Operations, and supply him with staff and equipment. This was the recommendation of a Research Committee of the Technical Section. It had been decided not to recommend laboratory operations at present, but to co-ordinate and supplement the work being done in mills, which in many cases now overlaps, and, in other cases, cannot be handled by the staff at any one mill.

The second proposal was to employ a forestry engineer, as a special secretary of the Woodlands Section, one of whose chief activities would be to devise, correlate and endeavour to operate, every means possible for the prevention of forest losses by disease, insects and fungi, and to study methods and means for using wood such as budworm-killed spruce. The request was for $10,000.

The third request was for an additional grant of $5,000 to complete the set of textbooks being published by the Joint Committee on Vocational Education of the Pulp and Paper Industry in the United States and Canada, this in addition to $21,000 previously given by the Canadian Association and $23,000 raised in the United States.

The first two proposals were referred back to their Committees for further consideration. The third proposal was accepted.

To us, the importance lies, not so much in the actions taken for the moment, on these proposals, as it does in the fact that such proposals were made, and seriously discussed, taking up a large part of this great industry's Annual Meeting. In the discussions that took place on all three proposals it was evident that opinion was well formed and almost unanimous in the principle that science was essential to industry.

The acceptance of the proposal to place an additional $5,000 in the budget for completion of textbooks was a renewed expression of the attitude of the industry, that all ranks of employees should have an opportunity to study the basic sciences, as applied to the manufacture of pulp and paper. In this way, it will not be many years before the way will be open for close scientific control throughout the industry.

We shall be pardoned, we hope, for referring so frequently to this industry. The fact is, we do not know of any other that, throughout the continent, is tackling its job more efficiently, from the ground up, and with the real good-fellowship that characterizes the pulp and paper industry.

Just note the progress in Canada, for example. In 1900, the industry here employed but two chemists, and one of them had to do draughting to hold his job. In 1913, the Canadian Pulp and Paper Association was formed. In 1915, the Technical Section was organized, and became an integral part of the Association, with about twenty members. To-day, it has nearly two hundred, on a fairly strict qualification basis. In 1918, a joint Executive of the Education Committee of the industry in Canada and the United States, was formed to compile and publish a set of textbooks, to be used for correspondence instruction and as works of reference. For these books, there has been raised almost $50,000, and they comprise the best work of reference published on any industry.

At the Montreal meeting, it was reported that, in Canada, one hundred and seventy men, from manager to "broke hustler" (the junior help in a paper mill), were enrolled as students in the correspondence courses provided in these books, and carried on by a specially organized institute, in the four months since September.

If every other Canadian industry could show similar development, just think what it would portend.

The two technical men employed in 1900 have grown to almost two hundred, in 1923, and another two hundred men are busy studying a systematic course, in the science and technique of the industry.

In addition, there is a well-defined policy for the addition of University men, by vacation employment, and by lecture courses, and the universities are co-operating.

One more thing: This work is surprising, but its best effects required ten years of good-fellowship, and perhaps in that last phrase "Good Fellowship" lies the secret.

What about it—Textiles, Leather, Packing-House, Paints and Varnish, Mining, Iron and Steel? We might even include Agriculture and the Canadian Manufacturers' Association itself. Are we really awake to do what we should be doing for ourselves, or are we hoping to get along by borrowing results from American or European

leadership, trusting that the Government will do something for our industries that can never be accomplished, except by the industries themselves?

CHEMICAL AND METALLURGICAL BUSINESS STATISTICS

A GREAT number of business people are devoutly thankful for what the Dominion Government is doing along this line,but we still have progress to make.

The Washington Government makes available detailed reports of imports and exports in the chemical field. The British Government gives access to such information almost hourly, and certain market report papers contain such news twice a day, for important ports. This is of the greatest assistance, in a business way, to those who are concerned, and companies have long ago forgotten to worry about having their names mentioned.

In Canada, we go so far, but not quite far enough. We are content to let the information accumulate and come out, perhaps six months later, and then not always in sufficient detail. Canadian business men in the chemical field are at a disadvantage, in that they cannot have that weekly, and almost daily contact with the detailed imports, that is the good fortune of business men in similar fields in other countries. The Government may say that this is too fast; it would be expensive. The answer is that it would be service and news that could be related to business. The money now spent on "cold" reports is not appreciated to anything like the extent that it should be, and the whole system would be much improved. if it were brought right up to the minute in items where there is a demand.

While on this matter, it might be pointed out that there are still gaps between Departments. For example, the vital business information essential to the investigator of a possible new Canadian industry is not always available. The Mines and Geology Department might be divided into two parts, one concerned with Geology, as the geologist sees it, and the other concerned with business as the man who wishes to utilize a clay, a metal, or non-metal ore, sees it. Perhaps what is required is a business promotion division. In a way, this is being done now, but quantities used and where, along with the grades required, is information not available in many instances. All statistical information, essential to the establishment of an industry in Canada, based on a Canadian ore, should be available. Perhaps more team work in the various branches of the Departments of Mines and Trade and Commerce is what we need. The first will point out the ore body on the map, and have some machinery for solving technical problems. The second will give some general information about imports and quantities used, or amounts manufactured, but is not specific in many cases, and some of its branches seem to see business more clearly, the greater the distance from Canada.

Where the Government is the only organization that can secure and give out essential business information, it should be well organized to handle anything required, particularly if there is a possibility of developing a use or market within the country for any raw or finished product we may possess.

CANADA AS AN EMPIRE MARKET

DIFFICULTIES beset the British manufacturer desiring to extend trade in Canada. At bottom, they arise from two main causes, the proximity of Canada to the United States, and the fact that Canadian buyers expect the seller to call on them and maintain a local organization of an aggressive type, giving a constant selling service. British firms have, on the whole, been rather poorly trained for trading under Canadian conditions. Men of affairs are accustomed to return to England and speak in glowing terms of the possibilities of Canadian trade; but there remains a vast lack of understanding on the part of many British manufacturers regarding the intensity of both local and foreign competition. Few British firms keep in sufficient personal contact with the market or their local agents. As a result, trade is lost, and not infrequently goods are left at the port of entry for ultimate disposal at great discounts.

A man's credit may not be a measure of his ability to succeed, when handling a new line or a new agency, which is very true of the lines of trade our readers are interested in. The day is gone when a large catalog, printed in England and sent out to a few Canadian companies, will secure business. It may have accomplished something, when conditions were radically different, and England was the only source of goods of quality at reasonable prices. No such passive attitude will bring business from Canadian firms. Unsuitable goods, even of the finest quality, are not desired by Canadians.

Probably one of the most important works which our Trade Department could undertake would be in the development of British branch factories in Canada. Splendid examples of success and failure in this line could be pointed out. Even limited operations would establish personal contact. The fatal misconception that branch factories are not likely to help the home plant, and are, therefore, to be avoided, still hinders British expansion.

The success of American branches in Canada should be a better guide as far as this portion of the Empire is concerned.

It may well be true that pressing local problems of finance have restrained many British firms from active selling operations in the Canadian field; but no great tendency in the direction suggested was indicated prior to present conditions. If we had more British capital put into small-scale manufacturing establishments under the joint guidance of Canadian leadership and British direction, the business possibilities of this country would be much better understood and appreciated.

GLUE MANUFACTURE IN MADRAS

The manufacture of glue at tropical temperatures is by no means the least important of the developments which owe their inception to the diligence of the Madras Department of Industries. A lecturer of the Madras Leather Trade Institute, by research and practical experience, has evolved a method of treating fleshings which yield a glue that will set under most adverse climatic conditions. The process of manufacture is simple, but if great care is not exercised at all stages, the results are disappointing. The fleshings are first treated mechanically, and then chemically cleaned. They are then digested with distilled water and the resulting liquor is first clarified and afterwards concentrated. Concentration is effected with the aid of pre-heaters, film evaporators and vacuum pans so linked up to one another as to permit of continuity and rapidity of operation. The concentrated liquor is then allowed to set in shallow plates cut into blocks and dried. The success of the process depends to a large extent upon reducing as low as possible the time during which raw material and resulting liquor are subjected to high temperatures.

While glue is put to an immense variety of uses, and the list is constantly extending, it does not come within the category of indispensable daily needs. To the carpenter and book binder it is a necessity, and it enters largely into the match, emery-sheet, sand-paper and printing industries. Mixed with white lead, chalk and sawdust it yields a composition suitable for artistic work; while, together with glycerine and treacle, it makes valuable printing rollers. Experiments have been made, with promising results, in applying liquid glue in the laying of macadam roads.

The Madras factory is still in the experimental stage, and is under departmental management. That this Madras glue is excellent in quality, is cheaply produced, and nothing approaching its standard is produced elsewhere in India, are well established facts.

Hide glue factories should gravitate toward leather centres in order to insure a steady supply of raw material at cheap rates; and glue factories should have, as adjuncts, small industries manufacturing roller composition, emery sheet and sand-paper.

CANADA—THE LEADING ASBESTOS PRODUCER IN THE WORLD

Next to coal, asbestos is undoubtedly the world's most important non-metallic mineral and Canada remains its predominant producer to the extent of something like 80 per cent. These two facts give ample proof of the importance and flourishing condition of the industry, which has been built up out of the asbestos resources of the Dominion. Rhodesia now holds second place in order of production and South Africa third. Russia has fallen out. Since the Canadian asbestos entered the world's market in 1885, and especially since the war, there have been many changes in the mining of the raw product, and the variety and forms of its application are becoming so numerous that its commercial value will become even greater in the near future. The war, which created so may new uses for the fibre, also helped in the development of the South African and Rhodesian deposits, and to-day the industry in these countries is on a sound basis, and for certain purposes the product is able to compete with the Canadian product, except in No. 1 Crude, which is a Canadian specialty. The Canadian chrysotile variety is essentially a hydrated silicate of magnesium. It has great tensile strength and flexibility, resists attacks of acids, and has remarkable fire-resisting qualities. It is also a good insulator for both heat and electricity, and is well adapted for spinning. Although the U.S. produces a relatively small quantity of asbestos, the manufacturers of asbestos articles and materials hold the foremost position in the world's asbestos industry. This is largely due to the close proximity of the Canadian asbestos and because a large amount of American capital is invested in Canadian mines.

ODORLESS MANUFACTURE OF CHEMICAL WOOD PULP

Swedish cellulose industries, in general, under the supervision of E. L. Rinman, have completed experiments with the satisfactory results of a newly invented method of producing cellulose, which is proved superior in many respects to the old vile-smelling methods. Rinman works with lyes that are free from sulphur, and succeeds in producing chemical products of high value from the organic substances which have been dissolved by the waste lye; while the sulphate method uses sulphur bearing lyes, and consumes as fuel the organic substances contained in the waste lyes; though not unlike in the actual production of cellulose, the two methods differ essentially in the composition of the boiling solvent, as well as the further treatment of the waste lye.

Dr. Rinman has succeeded in making the manufacture of cellulose entirely odorless by using sulphur-free lye, thereby solving a most vexing problem which innumerable efforts in the past have failed to solve. There is, at the same time, great economic advantage in being able to utilize the large amount of organic substance, comprising 50 to 65 per cent. of the volume of the wood, which escapes during the boiling of the cellulose and passes into waste lye.

ANALYSIS OF MONAZITE

The hitherto published methods for the attack of monazite are either tedious or else leave large quantities of the rare earths undissolved. By the following, the whole of the mineral can be readily brought into solution. About 1 g. of the finely ground material is heated for five hours with 5 cc. of sulphuric acid (sp. gr. 1.84) at 230 deg. C. The resulting pasty mass is gradually poured into iced water, when all but a small residue passes into solution. This is filtered off and again heated with sulphuric acid, a little hydrofluoric acid being added to volatilize the silica. The residue is then melted with six parts of sodium carbonate. On treatment with water the tantalum passes into solution, and any slight residue still remaining will be zirconia, and may be brought into solution by fusion with potassium bisulphate. In the subsequent analysis, the rare earths should be precipitated by oxalic acid at 55 deg. C. in a solution containing 0.15 to 0.75 per cent. of sulphuric acid, and with an excess of 3 per cent. of oxalic acid. At this temperature precipitation may be considered quantitative for yttrium, thorium, cerium and didymium. Lanthanum oxalate, being the most soluble, is not completely precipitated, and 50 cc. of the solution under the above conditions would retain 0.011 g. in solution.

Characteristics of Different Types of Canadian Household Fuels*

A Survey and Discussion of Physical and Chemical Methods of Inspection and Comparison

By R. E. Gilmore, J. H. Nicolls and H. Kohl†

Part I—The Relative Value of Chemical and Physical Properties of Household Fuels

BY chemical and physical analysis of a given fuel its properties may be determined and thus compared with a standard or other fuels. The physical characteristics or peculiarities of a fuel are, in most cases, quite important, and among the properties the burning qualities are most important. Although strictly speaking, the burning or combustion of a fuel does not take place without chemical action, what is meant by burning qualities are the physical manifestations of its chemical properties during combustion under ordinary conditions. A fuel may, indeed, according to its chemical properties, be classed as a good fuel, but when tried out under domestic household furnace conditions may prove quite unsatisfactory.

The main class of household fuels of interest here is, of course, the higher type of coals, generally known as anthracites. Other fuels, however, of special interest as a result of the present shortage of Pennsylvania anthracite are as follows:—

Welsh anthracites.

American anthracites (pea size and smaller).

Anthracite briquettes.

Coke—metallurgical and gas.

Peat (air dried bricks).

Hardwoods and charcoal.

Cannel coal.

Fuel oil.

"Soft" (bituminous) coals.

Electricity.

Chemical Analyses

Most of the different fuels just given will respond to what is generally termed chemical analysis to the same extent as coals. Chemical analysis—in general—consists of both ultimate analysis and proximate analysis. In a so-called chemical analyses, or at least in chemical laboratory reports, are included calorific value or heating units, coking properties, etc. Under their respective heads, the following is what is generally reported:—

Ultimate Analyses.	Proximate Analyses.
(a) % Carbon.	(a) % Moisture.
(b) % Hydrogen.	(b) % Ash.
(c) % Nitrogen.	(c) % Volatile Matter
(d) % Sulphur.	(d) % Fixed Carbon (by difference)
(e) % Oxygen (by difference).	(e) Coking Properties.
(f) Calculated Calorific Value.	(f) Calorific Value (determined).
(g) Carbon—Hydrogen Ratio.	(g) Fuel Ratio = $\frac{\text{Fixed Carbon.}}{\text{Volatile Matter.}}$

Since the time required to carry out a proximate analysis is much shorter than that required for ultimate analysis, and since by means of the former to which is added the calorific value, the comparative value of a given fuel can be ascertained, the ultimate analysis is seldom carried out.

Necessity for Proper Samples

When a sample of coal is sent in for analysis to a Government chemical laboratory such as ours, we assume that the person or party submitting the sample not only considers himself responsible for the very important matter of the taking the sample, but also is acquainted with its looks and general physical properties. The main reason for this assumption is that the sample is usually not large, and in order to live up to the public's confidence in the chemist's capabilities we have to go through the usual procedure on the sample, great or small. In this respect, then, the analysis is made on the sample submitted; and only when the chemist or his directing officer is made responsible for the taking of the sample will the carrying out of the analysis and the consequent report be more satisfactory to all concerned than is generally the case.

Meaning of Fuel Analysis Reports

Unless a report on such as burning qualities, handling qualities, etc., is asked for, and a sufficiently large sample is submitted, a report of analysis will be mostly of a chemical nature, and may, indeed, be misleading. For example, the heating value of an anthracite may be quite high and its volatile matter content low, etc., but on trying out its handling and burning qualities it may be found to contain such a large proportion of fines that it will not burn under certain furnace conditions. This, then, leads us to the importance of the physical properties.

Before leaving this part, however, it may be wise to go more fully into what is meant by chemical analysis. To confirm to a more or less true definition of the term "chemical analysis," the coal must undergo a chemical change without being examined. This is true in practically all the analyses, except the determination of moisture content, and with most fuels it is quite likely some chemical change does take place even in drying at 105 to 110° C. The drying is done in a current of carbon dioxide to prevent oxidation. The ash content is determined by burning to a constant weight about a gram of the finely powdered sample in a porcelain crucible placed in a muffled furnace. This usually takes from 5 to 6 hours, and remarkably close checks are obtained. The volatile matter determination is more difficult, and the results are empirical only. The volatile matter is determined by heating about a gram of the fuel to be examined in a platinum crucible with a close-fitting lid, at approximately 900° C. for seven minutes. For coals that spark excessively a slow method is used, i.e., $3\frac{1}{2}$ minutes at low heat and $3\frac{1}{2}$ minutes at high heat, but most coals will stand the fast method, i.e., 7 minutes at 900° C. The total loss of weight, minus the moisture loss, is the volatile matter content. This is sometimes termed "Volatile combustible," meaning that all the gaseous volatile matter is combustible, but this is not always true, for in a case of high oxygen content (low grade) fuels the volatile matter may have such a high CO_2 content that it will not support combustion. The fixed carbon is not a determined figure, but is arrived at by calculation. The sum of the moisture, ash, and volatile matter percentages subtracted from 100 is the fixed carbon percentage; and a practical interpretation of fixed carbon content is the amount of coke or charcoal that, without access of air, a given fuel will yield when carbonized at 900° C, i.e., about white heat.

In an ultimate analysis of coals and other fuels the total carbon and hydrogen contents are determined in the same analysis. A half a gram to a gram of the sample weighed into a small porcelain boat which, after being placed in a quartz tube, gas electric furnace apparatus, is burned to complete combustion in a current of dry oxygen. The carbon and hydrogen are burned to CO_2 and H_2O respectively, which, by means of KOH and Con. H_2SO_4 absorption bulbs placed in the closed oxygen gas circulating system, are collected and weighed. A check on the ash content is incidentally obtained here. The nitrogen content is determined by the well known Kjeldahl method, and the sulphur by the peroxide bomb or the Eschka method.

*Paper delivered November meeting, Ottawa Section Society Chemical Industry. Published by permission of the Director of the Mines Branch.

†Superintendent and Engineering Chemists respectively of the Fuel Testing Laboratories, Ottawa (B. F. Hannel, Chief of Division).

The oxygen content is not determined, but is arrived at by difference.

The calorific value determination is made in a calorimeter, where the sample is burned in a bomb to complete combustion, either by means of sodium peroxide or by oxygen under pressure, and the heat given out is measured by the extent to which a given quantity of water is raised in temperature. The more accurate calorimeters are those of the oxygen bomb types, and these supplied with the adiabatic jackets are not only accurate, but are also speedy.

In a chemical analysis, the fuel under examination is burned to complete combustion, which is seldom accomplished in the use of fuels in ordinary household or industrial heating appliances. For this reason mainly, chemical analysis may not really mean much to the average household user of fuels, and it may be justly claimed that chemical analysis for the higher grades is designed more for the purpose of classifying fuels. And the classification of fuels is not by any means complete without taking into account their physical or characteristics, and for the purpose of valuating a given fuel the physical properties are often more important than the chemical. The chemical properties, however, linked up with the physical characteristics or vice versa, are most important. For any coal or fuel, the physical peculiarities of which are not known and not appreciated, the chemical analysis may turn out to be quite invaluable for practical purposes to the user of such as a household fuel. For example, for high grade coals such as Welsh anthracite, after repeated handling, the chemical analysis of a sample containing a high degree of fines is worth very little compared to the general physical characteristics. Again, for "Sudbury coal" a chemical analysis of the coal nuggets shows it to be a very high grade form of carbon, but the physical examination and burning qualities of the bulk coal-rock agglomerate as mined is a different story.

Physical Analysis

Among the physical properties of fuels of interest here are the following:—

1. **Structure**—(a) Specific gravity and apparent specific gravity (i.e., dense on porous).
2. **Handling Qualities**—(a) Friability (i.e., easy or hard to break); (c) Percentage fines; (d) Clean or dusty.
3. **Storage Qualities**—(e) Bulk, lbs. per cu. ft., etc.; (f) Liability to spontaneous combustion.
4. **Burning Qualities**—(g) Smokeless or smoky; (h) Ignition temperature; (i) Free ash or clinkers (fusibility of the ash); (j) Efficiency of burning.

Discussion on Physical Properties

It is difficult to discuss the various physical characteristics according to the arrangement just given, as the individual properties are so inter-related and hard to treat as separates, and indeed some of the properties may be claimed to be chemical rather than physical.

The true specific gravity of the coal particles, the specific gravity of the lump, and the apparent specific gravity are all different. For ordinary purposes, however, the comparative density of the lump of coal or fuel as such and the co-related apparent density of the pile of lumps, large and small, are important in that by means of the apparent specific gravity different fuels may be compared as to their denseness and storage space required. The apparent density of the lump and of the pile of lumps as marketed do not vary so much for the higher grades of coals as they do for the lower grades, and the low apparent density of substitutes for Pennsylvania anthracite, such as coke, peat and hardwoods is one of their chief drawbacks.

Coming to the handling qualities of a coal, whether the coal substance is hard and brittle or soft, has a direct bearing on the percentage of fines it will produce on repeated handling, and the degree of friability will determine whether the product will be clean or dusty. In this respect there is a distinct difference between anthracites from Wales and anthracites from Pennsylvania. Results of tumbling tests carried out recently in our laboratory on the lumps of the best grade Welsh anthracite (i.e., the lumps after repeated handling) showed up only slightly inferior in respect to hardness to equal sized lumps of stove Pa. anthracite, and indications are that once Welsh anthracite was screened and sized for the household market, it would be practically as satisfactory, and may be better than the corresponding American grades.

The comparative bulk of fuel in respect to storage qualities is quite important, and is, of course, dependent on the apparent specific gravity of the pile of lumps. For peat the recent improvement of the density quality for air-dried bricks is noteworthy. In 1917 and up to 1921 the weight per cu. ft. of peat averaged about 26 lbs., while the 1922 peat averages about 32 lbs. This improvement of 6 lbs. per cu. ft. or (7.7 lbs) per bushel has a direct beneficial bearing on the handling and burning qualities of peat.

The general burning qualities for the various types of household fuels are quite different, and it is here that the proximate analysis of coals and other fuels along with the calorific value is of importance. Whether a fuel is smokeless or smoky depends to a great extent on the volatile matter content. It also depends on the degree to which the volatile matter is combustible under practical conditions, and this in turn depends on the relative supply and temperature of the oxygen in the draft air admitted to the combustion chamber. If the volatile matter percentage is low, say below 11 to 12%, the fuel will be smokeless, or nearly so; and if the percentage volatile matter is high there is liable to be considerable smoke when used in the ordinary household furnace. This smoke may be either a white smoke, such as from wood or peat, or a black smoke, such as from soft coals.

Whether a fuel yields on burning a free ash or clinkers depends mostly on the compostion of the ash content. The presence of certain proportions of sulphur, silica, iron, etc., will give clinkers, and in this respect the temperature at which the ash is fusible is important.

The calorific or heating value expressed in BT.U. per lb., has value only in a relative sense, and principally to compare one fuel with another. For the higher grades of coals, both anthracite and bituminous, the calorific value does not vary to any great extent. The bituminous coals as a rule show a higher calorific value than the anthracites, which goes to show that it is the efficiency with which a coal can be burned rather than the total heat present in a fuel as determined by the calorimeter, that is important. The higher grades of soft coals, i.e., the bituminous coals, as everybody knows, are not satisfactory in the ordinary furnace, due to the low efficiency with which they can be burned, but they nevertheless can be considered substitutes for hard coal and in household hard coal furnaces. It is true they give very annoying black smoke at times, but with careful attention to the flues and chimney pipe line, soft coals can be used instead of hard coals. In the extreme east and west of Canada, as in many states in U.S.A., bituminous coals produced locally are used, and in the middle west the lower grades of soft coals, i.e., the sub-bituminous and lignites are used for house heating purposes. Investigational work in these areas apparently follow the logical course of studying the best method of firing: how ordinary furnaces can be altered for better efficiencies and less smoke, and includes the very important programme of invention and installations of new designs of household furnaces. Taking into account the much lower price of the high grade bituminous coals to offset their much lower burning efficiencies, it is questionable if the economical advantages may not indeed over-rule the more or less psychological smoke nuisance.

Coming to the lower grades of soft coals and to wood and peat as substitutes for "hard" coals, the calorific value expressed in B.T.U. per lb. is more important. But for these, as also

with both metallurgical and gas coke, the term heat units per cu. ft. would mean much more for the average household stoker. As for peat, which is beginning to be recognized as a splendid supplementary fuel for spring and fall, the B.T.U. per lb. figure as compared with that for hard coal, cannot be interpreted literally. In the furnace or kitchen range, peat has merits similar to hardwood (many consider it better) for quick fires and for fires of short duration. When used in this way, about 1½ lbs. of 7150 B.T.U. peat may be considered equivalent to or better than 1 lb. of 12500 B.T.U. hard coal. Further, we have on record where, for certain industrial purposes, 1 ton of peat (7150 B.T.U. per lb.) accomplished the same results as 1 ton of soft coal (13000 B.T.U. per lb.).

The seeker after technical advice on fuels should be warned that, unless common sense as to the physical characteristics and peculiarities of the fuel submitted for analysis is exercised, a chemist's certificate of analysis may indeed be of little value. By close and wholesome co-operation of the chemist with the engineer, or the chemist with his client, the interpreted chemical analysis of fuels, linked up with their physical properties, is more than likely to be most valuable.

A Fuel Standard

Since both chemical and physical analysis are of great use in the comparative sense, we must have a standard fuel with which to do the comparing, and with certain reservations, high grade Pennsylvania anthracite is to be considered as the standard household fuel (for Central Canada at least.) In the writer's opinion it has to a certain extent earned the name "millionaire's coal," and for this reason the household coal users, although we have the millionaire's fuel taste, we must look for substitutes —ultimate, if not in the immediate future.

For the present generation, on account of the good graces and the desire for a Canadian market of our neighbors to the south, the continual cry of substitutes is probably not warranted, but in two or three generations from now the situation will likely be quite different, and it is the duty of a government laboratory to be in a position to give advice as to substitutes when both temporary and ultimate shortages appear. In times of shortage like the present, the word substitute may not mean cheaper fuel, but it apparently does mean a lower grade fuel than our standard.

Importance of Ignition Temperatures

In considering the different supplementary and substitute fuels the ease with which a fire can be started and maintained is to be taken into account, and in this respect the ignition temperature, along with the structure properties, is quite important. Table I gives the proximate analysis and calorific values of 30 different fuels. In order to balance the chemical analysis the following general characteristics table, giving the handling qualities, storage qualities—including lbs. per cu. ft.—coking qualities and general burning qualities has been added.

Most of these analyses are those of samples submitted to our laboratory for examination; the remainder are analyses from reliable sources. The proximate analyses given are those of single samples rather than averages for different classes or groups. Care has, however, been taken to see that the analyses are representative, and in so far as the analysis chosen for our standard, viz., Pennsylvania anthracite, is that of a good grade; the other analyses given are comparative for good grade fuels in their respective classes. The figures under ultimate analysis are average for several coals rather rather than for a definite sample, and do not necessarily correspond to the sample for which the proximate analysis is given. Under "general characteristics," our grading is purposely given wide limits, and must be considered as applying to the different fuels as supplied for domestic household purposes.

Part III.—Classification of the Higher Grade Coals

During the past few months we have had occasion to analyse three different grades of Welsh coals—(1) anthracite, (2) "semi" or "dry" anthracite (called "carbonaceous" by the British Geological Survey) and (3) semi-bituminous, and to differentiate between their respective chemical and physical properties. The purpose of this paper is to apply to these coals a few of various systems suggested for classification, and to compare

TABLE I—CHEMICAL ANALYSIS

	Proximate Analysis and Heat Units (Air Dry Basis)							Average Ultimate Analysis (Ash and Moisture Free Basis)		
	H_2O %	Ash %	Volatile Matter %	Fixed Carbon %	Sulphur %	Fuel Ratio	B.T.U. per lb.	Total Carbon %	Hydrogen %	Carbon Hydrogen Ratio
Pennsylvania Anthracite	2.5	11.0	7.0	79.5	0.7	11.2	12,930	92.8	3.00	30.9
Welsh (best grade) Anthracite	1.9	4.4	8.3	85.4	1.0	10.2	14,640	93.5	3.75	24.9
Pa. (Connel Coal), Semi-Anthracite	3.4	11.5	8.5	76.6	0.6	9.0	13,150	91.4	3.80	23.8
Welsh (dry) Semi-Anthracite	1.0	3.0	12.1	83.9	...	6.9	14,880	92.6	4.30	21.5
Banff, Alta, Semi-Anthracite	0.8	14.0	10.0	75.2	0.6	7.5	12,900	90.8	4.10	22.3
U.S.A. Anthracite Briquettes	4.0	15.2	9.0	71.8	...	8.0	11,690	....	....	....
Welsh Anthracite Briquettes	4.3	5.3	10.5	79.9	...	7.6	13,900	....	....	....
Pa. Semi-Bituminous	1.1	7.4	15.8	75.7	1.5	4.8	14,500	89.6	4.45	20.1
Welsh Semi-Bituminous	1.0	4.0	18.7	76.3	...	4.1	14,930	91.3	4.70	19.4
Alta. (Canmore) Semi-Bituminous	2.0	9.3	13.4	75.4	0.9	5.6	13,570	89.2	4.45	20.0
Nova Scotia Semi-Bituminous	0.9	8.5	16.0	74.6	1.1	4.7	14,260	....	....	....
Pennsylvania Bituminous	1.3	9.8	33.9	55.0	2.8	1.6	13,670	....	....	....
Durham (Eng.) Bituminous	1.3	6.4	36.3	56.0	2.6	1.5	13,680	....	....	....
Crow's Nest Pass, B.C., Bituminous	1.5	12.5	23.9	62.1	0.5	2.6	12,990	86.6	4.95	17.6
N.S. (Westville), Bituminous	1.6	11.3	24.6	63.5	1.5	2.5	13,190	86.2	5.15	16.8
N.S. (Sydney) Bituminous	1.9	5.4	34.3	58.4	2.3	1.7	13,770	81.9	5.45	15.0
N.B. (Minto) Bituminous	0.9	14.3	31.9	52.9	5.7	1.7	12,780	82.1	5.35	15.4
Alberta Sub-Bituminous	4.0	8.3	37.8	49.9	0.2	1.3	11,790	78.3	4.95	15.9
Alta.-Edmonton (high grade) Lignite	18.9	9.3	26.6	45.2	0.4	1.7	8,780	73.8	4.85	15.3
Sask., Estevan (low grade) Lignite	25.8	8.1	30.4	35.7	0.4	1.2	7,980	69.5	4.95	14.1
N.S. Metallurgical Coke	1.0	8.5	1.7	88.8	1.2	....	13,090	....	....	....
U.S.A. Metallurgical Nut Coke	0.9	17.4	2.0	79.7	1.3	....	11,200	....	....	....
Gas Coke (Ottawa)	0.8	11.5	1.5	86.2	0.9	....	11,930	....	....	....
Low Temperature Coke	0.4	9.3	26.6	63.7	1.2	....	13,450	....	....	....
Peat (Air Dried Bricks)	24.5	4.7	49.3	21.5	0.2	....	7,150	....	....	....
Peat Charcoal	4.7	12.1	27.4	55.8	0.5	....	11,390	....	....	....
Hardwood (average)	(25.0)	(1.0)	(64.5)	(9.5)	....	....	6,480	49.5	6.1	....
Hardwood Charcoal	5.0	4.0	17.9	73.1	...	....	12,660	....	....	....
Cannel Coal	1.5	19.3	45.1	34.1	1.2	...	12,340	....	....	....
Light Fuel Oil	...	....	....	....	...	....	19,000	(85)	(14)	....

TABLE II

Classification by Fuel Ratio—Fixed Carbon/Volatile Matter
U.S. Geological Survey

Anthracite	Not less than 10.	Penn. Anthracite	11.2
		Welsh Anthracite	10.2
Semi-Anthracite	(6 or 7) to 10	Penn. Semi-Anthracite	9.0
		Banff, Alta	7.5
		Welsh Semi-Anthracite	6.9
Semi-Bituminous	3 to (6 or 7)	Canmore, Alta	5.6
		Penn. Semi-Bituminous	4.8
		Brazeau, Alta	4.4
		Welsh Semi-Bituminous	4.1
		Jasper Park, Alta	3.4
Bituminous	Less than 3	Crow's Nest Pass, B.C.	2.6
		Westville, N.S.	2.5

TABLE III

Carbon/Hydrogen Ratio—Ash and Moisture Free Coal
Pollard—British Geological Survey

Anthracite	22 and over	Penn. Anthracite	30.9
		Welsh Anthracite	24.9
		Penn. Semi-Anthracite	23.8
Carbonaceous or Semi-Anthracite	20.3—23.35	Banff, Alta	22.3
		Welsh Semi-Anthracite	21.5
Semi-Bituminous	16.6—20.4	Penn. Semi-Bituminous	20.1
		Canmore, Alta	20.0
		Brazeau, Alta	19.6
		Welsh Semi-Bituminous	19.4
		Jasper Park, Alta	18.6
		Crow's Nest Pass, B.C.	17.6
		Westville, N.S.	16.8
Bituminous	14.6—18.2		
Per-Bituminous	12.9—14.7		

TABLE IV

Grout's Classification of Ash and Moisture Free Coals.

	Fixed Carbon	Total Carbon		F.C.	Total C.
Anthracite	Over 93	.....	.....	.....	.....
Semi-Anthracite	83–93	.....	Penn. Anthracite	92.0%	.....
			Welsh Anthracite	91.6%	.....
			Penn. Semi-Anth.	89.4%	.....
			Banff, Alta	88.0%	.....
			Welsh Semi-Anth.	87.4%	.....
			Canmore, Alta	84.2%	.....
Semi-Bituminous	73–83	.....	Penn. Semi-Bit	82.8%	.....
			Brazeau, Alta	81.2%	.....
			Welsh-Semi Bit	80.3%	.....
			Jasper Park, Alta.	77.4%	.....
High Grade Bit	48–73	82 –88	Cr. Nest P., Alta.	72.0%	86.6%
			Westville, N.S.	71.6%	86.2%
Low Grade Bit	48–73	76.2–82	.....	.....	.....

them with similar coals from Pennsylvania and with the highest grade coals mined in this country.

The attached tables show three schemes of classification applied to the higher grade coals. The "fuel ratio" (Table II) and carbon-hydrogen ratio (Table III) are two generally accepted bases for classification. Grout's scheme (Table IV), which is based principally on the fixed carbon, is not so well known, but is worthy of comment. It will be noted that the coals come as a rule in the same order, except that the Canmore coal and the Pennsylvania semi-bituminous are transposed in Table III; here, however, the carbon-hydrogen ratios are practically identical. The principal difference between the tables is that the divisions betwen the classes vary considerably.

The classification by fuel ratio seems to be satisfactory, except that it places Canmore coal in the semi-bituminous class, whereas it is often considered as a semi-anthracite. It should be remarked that this classification is not merely so serviceable when applied to the lower grade coals. A substitute, known as the "split volatile" ratio, or:—

$$\frac{\text{Fixed carbon} + \frac{1}{2}\text{ volatile matter}}{\text{Moisture} + \frac{1}{2}\text{ volatile matter}},$$

proposed by Dr. Dowling of the Canadian Geological Survey, is much more satisfactory for the bituminous and lignite coals. This, however, has the disadvantage of being applied to the "air dried" coals, air-drying conditions being as yet by no means standardized.

Pollard's scheme seems to be at fault in that it places the Pennsylvania semi-anthracite in the first class, and the Crow's Nest and Westville coals among the semi-bituminous. This scheme of classification is not serviceable for the lower grade coals, the carbon-hydrogen ratio on the air-dried coal being more satisfactory.

In Grout's scheme the Canmore coal comes into the semi-anthracite class, but he has set his limits for the anthracite class so high that none of the coals which we are considering will fit into it. Otherwise his classification seems very good, probably the best of the three.

There are numerous other suggested schemes for classification. Seyler's classification, depending upon the respective percentages of carbon and hydrogen in the pure coal, seems to be accepted

TABLE I—Continued. GENERAL CHARACTERISTICS

	Handling, Storage, Coking and Burning Qualities				
	Handling qualities	Storage qualities	Lbs. per cu. ft.	Coking qualities	Burning qualities in hard coal furnaces.
Pennsylvania Anthracite	Very good.	Good.	55	Non-coking	Good, smokeless.
Welsh (best grade) Anthracite	Fair to good.	Good.	55	Non-coking.	Good (when screened, smokeless
Pa. (Connel Coal) Semi-Anthracite	Fair to good.	Good.	47	Non-coking.	Fair to good, smokleess.
Welsh (dry) Semi-Anthracite	Fair.	Good.	51	Non-coking.	Fair, practically smokeless.
Banff (Alta.), Semi-Anthracite	Fair to good.	Good.	..	Non-coking.	Fair to good.
U.S.A. Anthracite Briquettes	Fair to good.	Good.	..	Coking.	Fair, some smoky.
Welsh Anthracite Briquettes	Fair.	Good.	51	Non-coking.	Good, some smoke.
Pa. Semi-Bituminous	Fair to good.	Good.	53	Poor coke.	Good, some smoke.
Welsh, Semi-Bituminous	Fair.	Good.	52	Fair coke.	Good when screened, some smoke
Alta. (Canmore) Semi-Bituminous	Fair to good.	Good.	..	Poor coke.	Good, some smoke.
Nova Scotia Semi-Bituminous	Fair to good.	Good.	..	Poor coke.	Good, some smoke.
Pennsylvania Bituminous	Fair to good.	Fair.	52	Gook coke.	Good but very smoky.
Durham (Eng.) Bituminous	Fair to good.	Fair.	46	Good coke.	Good, but very smoky.
Crow's Nest Pass, B.C. Bituminous	Fair to good.	Fair.	..	Good coke.	Good but smoky.
N.S. (Westville) Bituminous	Fair to good	Fair.	..	Good coke.	Good but smoky.
N.S. (Sydney) Bituminous	Fair.	Fair.	..	Good coke.	Good but very smoky.
N.B. (Minto) Bituminous	Fair.	Fair.	53	Fair to good.	Good but very smoky.
Alberta Semi-Bituminous	Good when freshly mined.	Fair.	..	Non-coking.	Fair to good, white smoke.
Alberta (high grade) Lignite	Good to fair.	Fair.	..	Non-coking.	Fair to good, white smoke.
Sask. (low grade) Lignite	Fair to good.	Poor.	..	Non-coking.	Fair, white smoke.
N.S. Metallurgical Coke	Good.	Bulky.	..	.....	Fair, some clinkers, smokeless.
U.S.A. Metallurgical Coke	Good.	Good.	39	.....	Fair, clinkers, smokeless.
Gas Coke (Ottawa)	Good.	Bulky.	32	.....	Fair, clinkers, smokeless.
Low Temperature Coke	Fair to good.	Fair.	..	.....	Fair to good, practically smokeless.
Peat (Air-Dried Bricks)	Fair to good.	Bulky.	32	Charcoal.	Quick fire, white smoke.
Peat Charcoal	Fair	Fair.	32	.....	Quick fire, smokeless.
Hardwood (average)	Good.	Bulky.	26	Charcoal.	Quick fire, white smoke.
Hardwood Charcoal	Poor (in bulk).	Fair.	16	.....	Quick fire, smokeless.
Cannel Coal	Good.	Good.	50	.....	Good only for grate.
Light Fuel Oil	.....	.....	53	.....	Good, smokeless.

for British coals, but is apparently inapplicable to coals from this country and the States. Coking properties, varying from "non-coking" for anthracite to good coke for bituminous, and back to "non-coking" for lignites, furnish a rough classification. The calorific value of the ash and moisture free coal serves as a basis for a gradation of the lower coals, but falls down for the higher ones, as anthracite has very often a lower calorific value than high grade bituminous. Parr proposed a classification based on the formula:—

$$\frac{\text{Volatile carbon (or total carbon-fixed carbon} \times 100}{\text{Total carbon.}}$$

This did not prove particularly satisfactory, and he has recently suggested a scheme based upon what he calls "Unit Coal," or the pure coal substance. The heat value for "Unit Coal" is derived from the following formula:—

$$\frac{\text{Indicated B. Th. U.} - 5000\ S}{1.00 - (1.08\ \text{Ash} \times 22/40\ S),}$$

and coals are graded according to this heat value. This seems very similar to the classification based on the calorific value of the ash and moisture free coal, except perhaps in the case of coals with a high sulphur content, and is again at fault in the case of anthracites. Parr has obviated this difficulty by a graphic diagram in which the B.Th.U. of the "Unit Coal" are plotted as ordinates and the volatile matter for "Unit Coal" as abscissae. In this way the coals are divided into definite areas, with very little overlapping.

Of the suggested schemes of classification, the "fuel ratio" seems the most serviceable for the higher grade coals. It at least indicates how any coal should be grouped according to its chemical properties, and suggests for what particular form of heating it should be serviceable. It should, however, be distinctly understood that physical properties play an important part, more especially as regards sizes. This is particularly applicable in the case of the Welsh coal imported to Canada, which contains lumps of various sizes, a lot of them too large to handle conveniently, and a great amount of fines. To offset this, the Welsh coal, while not grading quite so high as that from Pennsylvania in respect to physical properties, contains very much less ash and has a higher calorific value.

Part III. The Ignition Temperature of Fuels

The temperature at which self-heating begins seems to be the most suitable definition to be used in defining ignition temperature. A fuller definition, when discussing household fuels, is the temperature at which the fuel in question suffers such an accelerated oxidation as results in a marked increase in temperature, accompanied with a marked increase in the products of combustion.

A casual review of the literature reveals that ignition temperature has been studied in connection with the following: (a) Fires in coal mines, e.g., "gob fires"; (b) liability to self-heat in connection with spontaneous combustion; and (c) pulverized fuel. The relation between the ignition temperature and the composition of the fuel, both chemical and physical, has also been studied. Apparently there is very little information available which is applicable to fuels as used in an ordinary household furnace.

Whether the chemical composition is as important or more important than physical structure as applied to household fuels is an open question. According to Sinnat and Moore, who report results on powdered fuels, the ignition temperatures given for the finely divided (-200 mesh) fuels are reverse to what is expected, viz., anthracite 258° C, peat 300° C, and cellulose 324° C, with wood charcoal at 248° C and Cannel coal at 230° C. For a fineness of 100 mesh the ignition temperature is about 100° C higher than the figures just given. According to Wheeler, who also worked on finely ground coal, the oxygen content has a direct effect on the ignition temperature—the higher the oxygen content the lower the ignition temperature. This would indicate that it is the type of fuel as well as the fineness that causes the ignition temperature to vary for different fuels, and since wood and peat are high oxygen fuels they would be expected to ignite at a lower temperature than the low oxygen fuels such as anthracite.

Just what the relation is between the ignition temperature of a given fuel and its free burning qualities is worthy of study. It would appear that the free burning qualities do not depend as much on the ignition temperature of the fuel as it does on the structure of the substance in respect to hardness or compactness. The rate, however, at which a given fuel will ignite sufficiently to accelerate oxidation is evidently associated with its free burning qualities, and according to practice this rate would seem to depend on the relative openness of the structure of the fuel in question. The relation then of the ignition temperature to the physical properties of a fuel is important.

The average ignition temperature for several German lignite "cokes" is given as 230° C, and figures from other sources for other fuels are as follows: Lignite from Manitoba, 380° C; bituminous coal, 410° C; anthracite, 390° C; and metallurgical coke, 360° C. Unfortunately, however, the various investigators have worked upon different types of fuels, which makes comparison of the different methods and results impossible.

Method of Determining Ignition Temperature

Two of the best methods for determining the ignition temperature of fuels in general are, shortly and roughly, as follows: (a) The coal, or fuel, to be examined is placed in a glass or iron tube which is fixed vertically in an electrically-heated bath of sand or molten lead, with a pyrometer placed in the coal and also in the bath; air is passed at a constant speed through the coal while the bath is being heated at a predetermined rate. The temperatures of both the bath and the coal are read at intervals, and then plotted against the time. The point at which the coal temperature curve crosses the bath temperature curve is termed the ignition temperature. (b) Using a similar apparatus as in (a) the air passing through the coal is examined at intervals for CO_2, and the point at which the CO_2 increases rapidly is called the ingition temperature point.

A combination of these two methods seems reasonable for determining the ignition temperatures of different fuels and different sizes of fuels. This method will also give an indication of the ralative burning qualities in connection with their use as household fuels. It may not be out of place to announce here that extensive work along these lines is included in the programme of the solid fuel section of the Fuel Testing Laboratories. This work is now being carried out, and the results will, it is expected, be available in the near future.

ALPAX. A NEW ALUMINIUM ALLOY

The name "Alpax" is given to a new alloy of aluminium and silicon which possesses remarkable properties. It does not contain a trace of copper, zinc or tin; yet it has practically the same physical strength and ductility as Admiral gunmetal; while it is fully 10% lighter than the other aluminium alloys containing copper or zinc, or both. It is invaluable for certain parts of areo engines and automobiles on account of its resistance to high temperatures and immunity to corrosion. Extremely thin castings can be made, and, what is of greater importance, single castings with considerable variations of thickness are now possible. The new alloy will be welcomed not only for the above mentioned uses, but wherever lightness, strength and elegance are required. If "Alpax" fulfills its promise, brass, which is so generally used for ship fittings, will most likely be replaced to a great extent by this new alloy.

DAHLIAS A SOURCE OF SUGAR

The American Dahlia Society is co-operating with the United States Bureau of Standards with a view to developing the possibilities of the dahlia as a source of sugar. The tuber of the dahlia yields a sugar known as "levulose." which is exceptionally sweet and said to be harmless to those suffering with diabetes.

An Attempt to Cheapen the Production of Zirconium Dioxide*

By J. W. Bain and Geo. E. Gollop

THE recent introduction upon the market of high grade zirconium ores at a comparatively low price, and the interest stimulated by the remarkable properties of the pure oxide of zirconia caused the author to investigate processes of purification with the aim of so cheapening the method of manufacture that the application of these properties may not be restricted to the present very limited field.

Sources of Ore

The chief sources of supply of zirconium ores are in Brazil and Florida. That imported from Brazil under the trade name of "Zirkite" carries from 70 to 80 per cent. ZrO_2, of which 55 to 65 per cent. is the natural oxide, the balance being combined with silica. The present price for 73 per cent. ore is considerably less than $100 per ton laid down in this country. No definite estimates have been made of the extent of the Brazilian deposits, but according to H. C. Meyer, who investigated them in 1915, "they have been traced for a distance of 15 miles between Cascata and Caldas, and if surface indications are of any significance are of vast extent." [1]

There are also very extensive deposits of zirconia sands in Florida, but it is more difficult to extract the zirconia when it is combined with silica and work was not attempted on these refractory ores.

Uses—Present and Prospective

The chief use of zirconia at present is as a refractory. The pure oxide has a melting point of 2950° C., according to Rodd.[2]

The fused oxide has a linear coefficient of expansion of 0.00000084, and material made from it will consequently withstand sudden changes of temperature to a remarkable degree. A report to the British Government in May, 1917, stated "Zirconia is one of the most refractory materials known, the oxide of 98% purity having a melting point of 3000° C. It is extremely resistant to the action of slags; it has a low thermal conductivity (about half that of ordinary fire brick), and a low coefficient of expansion, approximately that of quartz glass. Zirconia is used in the manufacture of special kinds of glasses, and finds application in the enamelled iron industry as a substitute for tin oxide. Its chief application in metallurgy, however, is as a refractory material of the highest quality, on which account it is especially suitable for furnace linings, as well as for crucibles, muffle or pyrometer tubes. The use of zirconium as a deoxidizing agent in metals and alloys was patented by Weiss[3], the claim being that the disadvantages accompanying the use of titanium for such purposes could be avoided. Less than 1% of zirconium was said to give sound castings and greatly to increase the tenacity and strength of the metal, further additions rendering castings less sensible to chemical reagents."

It is used to a small extent in certain grades of incandescent mantles. It has also received an important application in the Nernst lamp, in which the incandescent body is composed of zirconia (85%), together with oxides (15%) of the yttrium series. It is also being used commercially in the United States as an opacifier of enamels, where a more resistent enamel is desired. Its wider use in this field, except in special cases, will depend upon the ability to produce an iron free oxide at a price to compete with tin oxide. Other uses as an abrasive, paint body, and rubber compound have been patented. The manufacture and use of ferro-zirconium as a deoxidizer and alloy for steel is a question of much interest, and has been the problem of a number of investigators for the past five years. Very little is definitely known about it. Remarkable properties are claimed for zirconium steel, and several interests are at the present time engaged in extended research to settle the conflicting claims made for this interesting substance.

Treatment of Ores

While the investigation herein described was in progress, a comprehensive study of zirconium was published by the U.S. Bureau of Mines as Bulletin 186, entitled "Investigations of Zirconium with special reference to the metal and oxide."

A discussion of the methods of preparing and purifying zirconium and its compounds, together with a very full bibliography, are to be found in this publication, and in consequence only a record of original work will be presented in this paper.

Before dealing with the fusion processes for treating ores, reference may be made to a useful method of preparing zirconium chloride of good purity for experimental purposes.

Treatment with Chloride or its Compounds

It is a well-known fact that $ZrCl_4$ can be formed if dry chlorine or phosgene is passed over heated zirconium bearing ore which has previously been mixed with powdered carbon. The iron and titanium being more volatile pass over first, and the $ZrCl_6$ can be collected fairly free from these impurities. Obviously, the greatest difficulty is the construction of apparatus to carry out this process commercially. The reaction is slow, and the yields for chlorine used are far from theoretical. However, the following experimental work was carried out.

50 grams to 200 mesh zirkite were intimately mixed with 25 grams of powdered graphite, placed in a 2″ quartz tube 30″ long. The tube was heated in a combustion furnace to a temperature of 600°-700° C., and dry chlorine gas passed over the mixture of ore and carbon. $ZrCl_4$ and $FeCl_3$ sublimed to the cold end of the tube and were subsequently removed. The yield of zirconium chloride from the above quantities was 67 grams. In this manner, several pounds of $ZrCl_4$ fairly free from impurities were made for later experimental work. The anhydrous chloride is an excellent material from which to obtain the desired oxide. The chloride can be dissolved in HCl and the oxychloride recrystallized from it, or it can be dissolved in water and precipitated as basic sulphate from solution upon addition of the proper amount of sulphuric acid. An experiment was also carried out by bubbling Cl_2 through CCl_4[4] and passing the dried gas over heated ZrO_2. Chemically pure ZrO_2 could be completely decomposed and the chloride sublimed in this manner or driven over from the ZrO_2 carbon mixture.

In an apparatus made from resistance glass throughout, all connections sealed in, heat supplied by a resistance furnace, snow white crystalline $ZrCl_4$ was made by resubliming the impure $ZrCl_4$ into an extended portion of the apparatus. The impurities in the $ZrCl_4$ could be driven out readily owing to their lower subliming temperature.

Treatment of Ores

Fusion Methods. The ore is fused with:

(a) Caustic soda.
(b) Sodium carbonate.
(c) Nitre cake.
(d) Potassium bifluoride.

These methods are described in Bulletin 186 referred to above and need no further reference.

Solution Methods:

Of these, the process employing ordinary concentrated sulphuric acid is the best, and it also excels the fusion method

*A contribution from the School of Engineering Research, University of Toronto.

in cheapness and convenience. This was adopted as the standard process for dissolving the ore in this investigation, and suffers only from the defect that a portion of the zirconium in the ore remains undissolved, as will be seen from the experiments to be described. Since the ore is relatively cheap this defect is not of great importance.

Preparation of Pure Zirconium Compounds

After extraction from the ore, the crude zirconium compounds—usually in solution—may be purified by any of the following methods:[5]

(a) Crystallization of the basic sulphates.
(b) Crystallization of the oxychloride.
(c) Precipitation with sulphur dioxide or sodium thiosulphate.
(d) Precipitation as phosphate.
(e) Preparation of potassium fluorzirconate.

These processes will give a pure oxide, but the resulting product is too expensive for any but special uses. The production of pure oxide is very limited, and according to information available is not being made in either U.S. or England in what might be termed large scale commercial qualtities.

The commercial use of ZrO_2 being restricted by the necessarily high cost of purification, any process to be successful must be simple, use cheap reagents, and at the same time give a reasonably pure product.

It was finally decided to use 66° sulphuric acid as the solvent for the ore. Fifty per cent. of the ore goes into solution in boiling acid in the proportion of 2 parts acid to 1 part ore. About 57% of the zirconia in the ore is soluble. The remainder of the ZrO_2 is combined with silica, and is insoluble under the above conditions. A temperature of 275° C. is advisable for complete disintegration of the free oxide. Excess sulphuric acid in this digestion is a disadvantage, since it must be removed by reagents in the precipitation of a basic sulphate. Use of nitre cake is an alternative method, and any later treatment of the solution such as is made in the case of sulphuric acid may equally be applied to the former.

Two grams of zirkite dried at 110° C. were digested for one hour in 25 cc. 1.84 sp.gr. sulphuric acid at 310-311°C., poured into 500 cc. water, and the latter boiled for half an hour. The undissolved portion was filtered by suction and washed with hot water. The residue was dried at 110°C., and upon weighing was found to be exactly 1 gram. On amounts of 1,000 grams ore to 3,000 grams acid heated for several hours with constant stirring, the mixture digested hot with about 2 gallons water and residue on filter washed, the amount of ore left was very close to 500 grams. Heating with sulphuric acid in a bomb at 300° for 6 hours did not show any increase in solubility. One gram of pure ZrO_2 digested with an excess of 1.84 sp. gr. sulphuric acid at 300° for 15 minutes went completely into solution upon dilution and boiling. Apparently the digestion with strong acid formed a sulphate which was soluble in dilute acid. Another sample of so-called 98% oxide heated with H_2SO_4 left a considerable residue of insoluble matter. The residue upon treatment with caustic soda showed the presence of much silica. It is safe to conclude that only that part of the ore uncombined with silica is soluble in sulphuric acid, and conversely only an oxide that is completely soluble in sulphuric acid can be considered free from silica.

Using some c.p. zirconium chloride left from previous experiments and following directions in U.S. Patent 1,316,107 (Pugh), a small amount of the $5Zr{:}3SO_4$ basic sulphate described therein was made up. The sulphate was redissolved by adding a small excess of sulphuric acid and an attempt made to reverse the process by removing the excess acid with $CaCO_3$. The solution was analyzed with the following result:

FeO_3. None present.
ZrO_2. 7.84 grams per litre.
H_2SO_4. 14.3 " "

According to the above-mentioned patent the proper condition for the precipitation of this basic sulphate is that the H_2SO_4 present should be approximately one-half that of the ZrO_2 content. The solution, the analysis of which is shown above, is too acid. Excess acidity was removed with $CaCO_3$, sufficient precipitated chalk being added according to calculation to bring the H_2SO_4 concentration down to 3.9 grams per litre. After filtering off the $CaSO_4$ formed, the filtrate was boiled, whereupon dense white precipitate formed which was practically insoluble in HC1; it was soluble in dilute sulphuric acid. It was assumed to be a basic sulphate, but in this instance was not analyzed nor the extent of the precipitation determined.

To follow up the results above given and to make them more quantitative, a solution was made up by digesting zirkite with 1.84 sp.gr. sulphuric acid at a temperature of 275° C. The almost dry residue was digested with hot water and filtered; the solution analyzed by the thiosulphate method gave the following:

ZrO_2. 39.5 grams per litre.
Fe_2O_3. 4.1 " "
H_2SO_4. 145.8 " "

By calculation 128 g. $CaCO_3$ were necessary to be added per litre to bring sulphate content down to one-half the grams per liter of the ZrO_2 present. This was sufficient $CaCO_3$ to precipitate practically all of the Z_1O_2 as well, although the supernatant liquor was still acid. By previous trial it was found that 3.2 grams of $CaCO_3$ precipitated all of the ZrO_2 content from 25 cc. of this solution. A series starting with 2.4 grams $CaCO_3$ and increasing by 0.15 grams until a maximum of 3.5 g. had been added was then made up. Each amount of calcium carbonate was triturated in a mortar with 25 cc. of solution, transferred to beaker and allowed to stand over night. Filtering was done by suction, and filtrate was made up to 30 cc. by running extra liquor through the filter. Each filtrate after the addition of 0.7 cc. conc. HC1 was boiled.

	Calcium carbonate added.	Reaction upon boiling filtrate.
(1)	2.40 grams.	No precipitate.
(2)	2.55 "	" "
(3)	2.70 "	" "
(4)	2.85 "	" "
(5)	3.00 "	Practically no ZrO_2 present in filtrate.
(6)	3.15 "	No ZrO_2 in filtrate.

5 cc. of solution (4) was diluted to 15 cc. and boiled. A heavy white precipitate came down which was insoluble in HC1 but soluble in H_2SO_4. The filtrate form this precipitate upon dilution and boiling again gave a precipitate.

5 cc. each of filtrates from 1, 2, 3 and 4 listed above were diluted to 15 cc., boiled for 5 minutes and filtered. Both residues and filtrate were analyzed for ZrO_2.

	Residue.	Filtrate.
(1)	0.0313 g.	0.1137
(2)	0.0429	0.1047
(3)	0.0680	0.0876
(4)	0.0551	0.0543

5 cc. of 3 and 4 were diluted to 250 cc. and boiled, filtered, etc., as above:

(3)	0.1310	0.0290
(4)	0.0956	0.0193

Thus showing great dilution is necessary to bring down any appreciable amount of the ZrO_2. Lack of concordant results

in the sum of ZrO_2 in filtrate and residue is caused by the retention of $Zr(OH)_4$, or insoluble zirconium salt, with the $CaSO_4$ filtered from solution.

Thinking that the presence of HCl in the solution when the $CaSO_4$ was filtered off might materially cut down the amount of zirconium salt remaining with the $CaSO_4$ when the latter was filtered off, it seemed that the use of $CaCl_2$ to diminish the sulphate content might be worth a trial, since it at the same time would add HCl to the system. The following experiments were carried out.

11 samples 25 cc. each were measured out and to each were added varying amounts of $CaCl_2$ solution (394.2 grams per litre), beginning at 6.5 cc., increasing amount in each by 0.5 cc. until in No. 11 were added 11.5 cc. Each solution, after standing for two hours, was filtered by suction. Each filtrate was made up to 30 cc. by water run through residue on filter, and was then boiled, but no precipitate appeared. 5 cc. of each were diluted to 15 cc. and boiled. A precipitate appeared in Nos. 5 to 11 inclusive, increasing in volume in each. 250 cc. of water were added to 5 cc. of each of solutions Nos. 5, 7, 8, 9 and 11, and the dilute solutions were boiled. Residues were weighed after ignition, and ZrO_2 in the filtrates was precipitated with sodium sulphate.

Not taking into account the zirconium-bearing solution still clinging to $CaSO_4$ residue, each 5 cc. taken represented 0.1645 g. ZrO_2; hence the yield in No. 5 was about 77.2 per cent.

	Residues	Filtrates
(5)	0.1270	0.0156
(7)	0.1269	0.0106
(8)	0.1190	0.0100
(9)	0.1218	0.0102
(11)	0.1128	0.0090

These results were not quite so good as those obtained by addition of $CaCO_3$, with the exception that the precipitate obtained was more granular and whiter in color.

A fresh solution was made up showing the following analysis:

ZrO_2	67.16	grams per litre.
Fe_2O_3	7.24	" "
H_2SO_4	222.00	" "

The ration of H_2SO_4 to ZrO_2 in this solution is slightly less than in the previous one. Using experiment Number 5 in the series reported above as giving greatest yield, calculations showed that 25 cc. of this solution would require 13 cc. of reagent $CaCl_2$ (394.2 grams per litre) to bring about approximately the same yield of ZrO_2 upon dilution and boiling. On testing these conditions, the dilution being diminished 20 per cent., the yield obtained was 74.4 per cent., calculated upon ZrO_2 content in the reagent solution.

In an attempt to determine the effect of dilution upon the precipitation, the following series was made up. To 20 cc. of soln. (67 grams per litre) were added 10.8 cc. reagent $CaCl_2$, and the resultant $CaSO_4$ filtered off; the $CaSO_4$ was washed until the total bulk of filtrate was 50 cc. 5 cc. samples of this filtrate were taken and diluted to 25, 50, 100 and 200 cc. respectively; the solutions were boiled, the precipitate filtered off, washed, dried, ignited and weighed:—

Dilution	Dilution of Reagent Solution	g ZrO_2 found	Extraction per cent.
25	12.5	.0662	49.3
50	25	.0889	66.2
100	50	.0964	71.7
200	100	.1082	80.6

By the addition of $CaCl_2$ the H_2SO_4 concentration is lowered, but the HCl content is at the same time increased. In order to try the effect of lowering the H_2SO_4 concentration while not increasing in the same proportion that of the HCl, it was decided to use a combination of precipitated chalk and $CaCl_2$. Sufficient chalk was added to reduce the H_2SO_4 concentration to an amount necessary to satisfy the ZrO_2 content according to the formula $Zr(SO_4)_2$ then $CaCl_2$ to bring the ratio $Zr:SO_4$ to 2 Zr:1 SO_4.

To 50 cc. of reagent $Zr(SO_4)_2$ soln. were added 5.76 g. $CaCO_3$. When effervescence had ceased 10.9 cc. of $CaCl_2$ soln. were run in. This mixture was digested cold for some minutes, filtered, and residue washed with hot water to a 100 cc. volume of filtrate. 5 cc. samples were diluted with 5, 10, 20, 50, 100 and 200 cc. of water respectively, and then boiled, filtered, washed and ignited. 5 cc. of this solution should contain .1679 g. ZrO_2, but analysis showed only 0.1206 g. The balance remained with the $CaSO_4$ residue, which should have been digested hot before filtering. However, calculating percentage extraction upon contents of solution (filtrate), the following results were obtained:—

Water added to 5 cc.	Dilution	Wt. of Residue	% Extraction based on filtrate
5	4 times	lost	
10	6	.0556	46.12
20	10	.0768	63.7
50	22	.0819	67.9
100	42	.1008	83.5
200	80	.1002	

To test the purity of the oxide made by the above procedure, 0.5 gram sample was fused with an excess of $KHSO_4$, the melt was taken up with water and the solution analyzed, according to selenious acid method as recommended by James[7]; the oxide showed a purity of 98.6 per cent.

Keeping constant the amount of $CaCl_2$ added, the weight of $CaCO_3$ was varied in an attempt to increase the yield and cut down the necessary dilution of solution before precipitation could be effected. Three samples of 25 cc. ZrO_2 solution (67.16 grams per litre) were taken, and to each were added slowly 2.0 g., 2.5 g. and 3.0 g. $CaCO_3$ respectively. After effervescence had ceased, to each were added $CaCl_2$ solution of 394.2 grams per litre. Each solution containing precipitate of $CaSO_4$ was brought to a boil, filtered by suction and sufficient wash water was used to bring volume of filtrate to 100 cc. Upon cooling, a precipitate formed in solution Number 3. This was boiled, and a further precipitation occurred. These precipitates were filtered off and 5 cc. samples of the filtrate remaining (100 cc.) were further diluted with 20, 50 and 100 cc. of water, boiled, filtered and residue washed and ignited. The following reaults were obtained.—

Grams Produced	% Extraction	Dilution of Original Vol.
0.8620	51.34	4 times
1.184	70.52	20
1.236	73.60	40
1.294	77.07	80

25 cc. of solution (67.16 grams per litre ZrO_2) diluted to 100 cc. gives 0.8620 g. ZrO_2, then to produce one pound of oxide it would be necessary to handle 14 gallons of solution giving a yield of only slightly over 50 per cent. of the ZrO_2 content of the solution. To obtain a greater yield much greater dilution is necessary.

cc. of Original Solution	Diluted to	Oxide Produced	% Extraction	Gals. to be handled
25	100 cc.	0.8620	51.34	13.9
25	500 cc.	1.184	70.52	50.6
25	1000 cc.	1.236	73.60	96.96
25	2000 cc.	1.294	77.07	185.20

A fresh reagent solution was made up by digesting 1 kilo of Zirkite in a cast iron pot with 3 times its weight of 1.84 sp.gr. H_2SO_4 for about eight hours above the fuming temperature; almost exactly one-half the ore went into solution. The filtrate from digestion of the ore made up to 5,500 cc. was analyzed by the selenious acid method and thiosulphate method. The

former gives the ZrO_2 and TiO_2 and the latter ZrO_2, TiO_2 and Al_2O_3.

Byselenious acida ZrO_2.... 72.76 grams per litre.
" thiosulphate " .... 79.88 " "
H_2SO_4 ($BaSO_4$).....230.1 " "
Fe_2O_3..... 11.0 " "

It seemed desirable to find out the free acid in this solution by titration against standard alkali, as the sulphate content determiend is not all free acid. This was done by titration against N. NaOH.

It was determined that for 100 cc. of acid $Zr(SO_4)_2$ solution there would be required 11.88 g. NaOH to start precipitation and 14.27 g. to complete it. From these results it was determined that to bring about the same result with $CaCO_3$ it would be necessary to add 14.85 g. $CaCO_3$ to start precipitation and 17.83 g. to complete it. Analysis of solutions by the selenious acid method gave 72.76 grams per litre ZrO_2; to satisfy this amount there would be required in the solution 116.3 grams per litre H_2SO_4. To bring about precipitation, titration showed that 118.8 g. NaOH must be added per litre. Thus, as a fairly close approximation, the alkali titration can be used to determine the free acid present which must be removed, and from this the corresponding amount of $CaCO_3$ necessary to add to bring about the same result.

Five 50 cc. samples of the stock solution 72.76 grams per litre, were heated to almost boiling and to each were added varying amounts of $CaCO_3$ according to the following table. When CO_2 had been completely evolved, the liquor was removed from the precipitate by suction. This liquor was analyzed for $ZrO_2 + Fe_2O_3$ content.

Sample	$CaCO_3$	$Fe_2O_3 + ZrO_2$ grams per liter	$Fe_2O_3 + ZrO_2$ in stock solution = 83.76 grams per liter
1..	5	79.84	
2..	6	77.92	
3..	7	77.60	
4..	7.5	81.12	
5..	8.0	73.36	

In the case of No. 4 and No. 5 the residues of $CaSO_4$ were washed thoroughly and the wash water was analyzed for its $ZrO + {}_2Fe_2O_3$ content. Upon adding this amount to that in the filtrate, the total agreed fairly closely with that in the stock solution, thus showing that the ZrO_2 does not precipitate with the $CaSO_4$.

To find the neutral point of the stock solution towards $CaCO_3$ the experiment described in above paragraph was repeated, but 100 cc. of stock solution was used in each case.

No.	$CaCO_3$	$Fe_2O_3 + ZrO_2$
1	10	87.9
2	12	87.9
3	14	88.3
4	16	85.7
5	20	All precipitated

The neutral point is between No. 4 and No. 5, which corresponds fairly closely to prediction made from normal NaOH titration.

To two samples of 100 cc. each of stock solution were slowly added 17 to 18 grams of $CaCO_3$, following the above procedure, and the filtrate was allowed to stand over night. Within 24 hours a white thick jelly-like precipitate, occupying about 90 per cent. of the volume of the solution, had appeared in the second solution, but the filtrate from the former remained clear. The precipitate was washed by decantation, filtered, dried, ignited and weighed. Calculated upon the content of ZrO_2 in stock solution the yield was about 75 per cent.

Summary

Zirconium dioxide is a very valuable refractory material, but cannot yet be produced cheaply.

Rich ore is available at low prices, but the cost of treatment is high.

The process herein described depends upon the treatment of Brazilian Zirkite with concentrate sulphuric acid, about 50% of the ore passing into solution.

The effect of varying dilution, acidity, temperature, etc., upon the precipitation of an insoluble basic zirconium sulphate is given in detail; the choice of the most favorable conditions in any particular case being left to the operator.

Since the process involves merely digestion of the ore with sulphuric acid, the addition of cheap substances, such as calcium carbonate and chloride, followed by heating, filtration of the precipitate and ignition, it is possible to prepare zirconium dioxide at a fairly low price.

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RUBBER LATEX IN PAPER MAKING

Mr. Frederick Kaye has perfected a new process for the employment of rubber latex in paper making. Rubber latex is a natural colloidal solution of rubber in an intensely active form, with 30 to 35 per cent. of actual rubber content, yet in the form of a perfectly limpid liquid miscible, with water in all proportions. In this form it can be perfectly associated with the paper making fibre without the expenditure of mechanical or thermal energy upon the ultimate ruhber particles. The rubber latex which is obtained by tapping the rubber yielding tree, is preserved in its liquid state when being shipped from the eastern plantations by the addition of a suitable anti-coagulant, such as ammonia. Mr. Kaye has found that 3 to $3\frac{1}{2}$ gallons of commercial ammonia per 100 gallons of original good latex is a safe amount for complete preservation of the latex. It is of the utmost importance in the process that the liquid state be preserved. It is then extensively diluted with cold and clean water, one gallon of latex to be diluted with 30 or more gallons of water within the working limits in the beaten capacity. This diluted latex is added slowly, after filtration through a fine sieve, to the beaten pulp in the beater. The latex quickly penetrates and becomes intimately associated with every particle of the beaten fibre. Experiments have shown that it is best to add the latex to the fibre towards the end of the beating process. The coagulation of the rubber is often a comparatively simple matter. In some cases, as with a sulphite pulp, and when small proportions of latex are needed, the fibre will take up the coagulated rubber without the addition of a coagulative agent. In many experiments Mr. Kaye has used such salts as magnesium sulphate as the coagulative agent, and in others such acids as acetic acid, but in most cases it was best to use alum exactly as in ordinary paper-making processes. It was important that with an alkaline pulp the final condition should be made faintly acid to prevent loss of rubber latex in the back water. Rubber latex has some specific effect upon the fibres in the beating engine and upon the rate of hydration of the fibres. It is in this direction that the value of rubber latex as a cheapening factor in paper production is seen to be so important. Even with the use of very small quantities of latex the texture and strength of the paper is improved and can be made water-proof. If has also been proved on a commercial scale that the value of waste paper can be increased by the use of rubber latex. It is possible to make goods to take the place of leather, and to produce boards of such a high bursting strain and capable of such a delightful finish they they might take the place of boards in the construction of furniture, etc. Many mills in Britain are alive to the commercial possibilities involved in the process, and are producing many grades and qualities of latex paper. Mills in Canada, U.S., Holland, Belgium, France, Norway, Sweden, etc., are also taking up the process with great interest, so that its future seems assured.

The Business of Buying Laboratory Equipment

By James H. Wilson

(Our observations on this question have led us to believe that a frank discussion of the subject, by a representative dealer, might be of interest to many chemists. With this in mind, we have asked the writer to give the dealers' viewpoint, exactly as he sees it.—EDITOR.)

The writer, during a period of some twenty years, has been engaged in the business of buying and selling chemicals and chemical apparatus. During that time, he has become acquainted with the idiosyncrasies of the professional man, as a buyer, and, as a result, it may be that this article will be of some help as a buying aid.

Chemical apparatus should be bought with as much care and thought, as you would use in selecting a home or an automobile. The first idea to fix in your mind is quality, the second service, and then price. Price is not considered last because it is of no consequence. If the quality is right and the service good, then the goods are worth their cost to you, plus the service. The highly advertised words, quality service and price, must be analyzed continually.

A remarkably few purchasers buy on this plan. It is more often simply, "Send me some of this, and a little of that." In many cases, neither size, quality or brand is mentioned. As a consequence, the dealer sends what, in his opinion, should meet the particular case. This must lead to mistakes frequently, and, as a rule, the purchaser wonders why the supply house did not send him what he wanted.

Buying a Balance

Taking the Balance as an example, we have one article that is generally bought with great care. Why only the balance? If the other equipment in your laboratory is not up to standard requirements, then your balance, no matter how sensitive it may be, and no matter what you paid for it, is relatively unimportant. On the other hand, there is the man to whom the utility of a balance evidently rests on its value or cost. His method is direct. A simple statement is made, such as, "I want to buy a balance." Inquiry is then made as to just what work he is doing, and, on receiving the necessary information he is then shown the best balance to meet his requirements. Let us assume, in a given case, that we are dealing with a chemist who wishes a balance for some research work he is doing. His work is very important, and we are assured that his balance must be the best possible. The sensitivity and accuracy must be without question. He looks over the balance, tries it out, perhaps tries two or three more, and a decision is then made on a particular model which meets his requirements in every way. Now comes the eternal question, "What is the price?" He is told, we will say, that the balance he desires and needs is $200, which is not high for a really good instrument. "I am afraid," he answers, "that the firm will not authorize that amount. What I really want is something around $100, or perhaps $105." This happens again and again, and what is the solution? It is not altogether the fault of the purchaser in this particular case. He selected the balance that met his requirements best, but could only spend about $100. This brings us to an important point in regard to the chemist in his role of purchasing agent. Why is it that in the office and the plant nearly everybody can get what they need except the chemist? If the typist required a new machine, noiseless, for example, no doubt she will get it. If the office-boy wants a stamping-machine, to save him the trouble of licking the stamps, he will prove the efficiency of his suggestion and stands a far better chance of getting it than our friend the chemist has of getting his balance. If the average salesman requires a good "flivver," he has only to make his wants known. Unfortunately, the laboratory, in many instances, is looked upon as a necessary evil, and any expense for the chemist with much suspicion. We note but a slow change of this condition, and hesitate to define the cause.

While the chemist may start the order, and name the items, he very often has but little to say in regard to where he shall buy or what price he should pay. In large plants, the chemist simply makes out a requisition covering his needs, which is passed to the purchasing agent, probably with a list of supply houses. In some instances, this works out very well, but not always. In some cases, when bids are received, the chemist is consulted regarding the placing of the order. With all due respect to the average purchasing agent, let us be frank and state that the chemist, in the purchasing of chemical laboratory equipment, should have full control of a decision of this kind. The purchasing agent will agree with anyone that he knows nothing about chemical apparatus, and yet a fair number insist that the only rule to follow is to buy at the lowest price. This theory, applied generally, would probably ruin the business of this firm, but it remains sound doctrine in matters beyond their ability. A price basis for standard or branded goods is a safe principle, but should not be extended unduly.

Buying Cheap or Used Equipment

Often laboratories are loaded up with goods of poor quality and little value, which the chemist, under ordinary conditions, would never think of buying. Perhaps some Government Departments are among the worst offenders in this respect, Requisitions may be approved readily enough, but, under a system designed for a different purpose, the Purchasing Commission is practically forced to accept lowest tenders. Often it is difficult for the chemist to send back articles purchased, and the tendency is created to again order, in the hope that quality goods will be secured. All chief chemists should be trusted with purchasing power, as they are already trusted with much more important work.

For Large Buyers

If you are a large buyer, there are many ways to secure the greatest value for your money. In some of the large educational institutions, a certain appropriation is granted annually to the departmental head for the purchase of equipment. This may be $2,000, $5,000, and is often much more. The usual method in cases of this kind is to secure competitive bids or tenders from a number of supply houses, in both Canada and the United States, and then compare prices. This is quite the right thing to do, if a few points are remembered.

First of all, when making out your list of requirements, specify from one catalogue only, and not from four or five. If you must use more than one, confine the majority of your requirements to one firm's goods, and you will save money. Cost and overhead must be added in, when creating a selling price, and it follows that the more catalogues you consult and use, the greater the time and overhead expense in preparing a reasonable bid. All dealers in laboratory apparatus exchange catalogues, and it is really not necessary to use more than one or two. The practice of picking out a few low items from various bids has little to recommend it, as the bid is intended only for the whole order.

When the time arrives to consider tenders, the following items should be taken into account. Is the price f.o.b. your own town or city? Does it include packing charges? Will there be, in the case of chemicals, an extra charge for

bottles? If the quotation is from the United States, or some other source outside of Canada, do not forget that you must pay 6% import tax on the total amount of your invoice. In addition, there may be a duty running from 17½% to 40%.

If you purchase from Germany you have no way of arriving at the cost until the shipment is actually in your laboratory. Those on the duty-free list still pay the 6% tax. All goods coming from former enemy countries are appraised by the Department of Customs, and the 6% and duty is paid on the amount which they think the goods are worth here. As an example, you might purchase a thousand dollars worth of goods in Hamburg, and have them appraised by the Customs at $5,000 or up. The average Customs official does not know the value of such a shipment, and appraises as high as possible. The writer knows of shipments that were raised by the Customs some 500% above invoice cost. The tax situation is complicated and ever-changing, and it should be mentioned that, in some cases, it is only 3¾%.

Many Canadian chemists do forget importing taxes and delivery costs. They assume packing, freight or express prepaid, as the case may be. These items may add 50% and even 100%, depending on the size and nature of the order. For example, articles could be named that might sell for $1.00 in the United States and result in an express bill of 75c and a tax of 50c.

Specifying Grade and Quality

When purchasing chemicals, do not forget to specify the grade or quality. Such words as "chemically pure," "technically purified," "granular," "crystal," "sticks," etc., are essential to an intelligent order. Alternatives should be specified, if you are impartial in particular cases. Do not, for example, put on your requisition "sodium chloride." The dealer will interpret this to mean the purest available, on the average, whereas a grade of less purity might meet your requirements.

How the Supply House has Served Chemists

It may be of some interest to know that supply houses render chemists a service of great importance by acting as a connecting link between various factory sources of supply and the laboratory. Many standard pieces of equipment, such as balances, electric ovens, certain types of distillation apparatus, thermometers, and numerous other lines are stocked by all supply houses, but manufactured elsewhere. Many factories, particularly in the United States, make apparatus for supply houses only. They may be put out under the dealer's name. This creates standardized equipment, and results in lower costs, and means, as a rule, much better goods. The system in the British Isles is a little different. Almost all apparatus house manufacturers (with the possible exception of glassware) their own lines. The result is a less standardization and higher prices. Much duplication of effort could be saved, if the American plan was adopted.

The large laboratory supply houses have rendered a service to chemists by the development of good equipment ideas. A particular chemist may have worked out an idea to a certain point. The laboratory supply dealer places it on a manufacturing basis, and creates a device which can be put on the market. In this way, they have made available and improved on articles which would have had a slow development otherwise.

Rush Orders

Buy all your equipment before you actually need it. Do not wait until the last minute and send a "rush" order. Others may also want that particular article. There is always the chance of an embarrassing position. If you rush all orders, you will have nothing to call a real "rush order."

The average chemist could do more than he does in the way of having all equipment repaired. An opinion can always be secured from your dealer on the advisability of repairing a broken or discarded piece of equipment. Chemists should feel free to do this, as many dealers have repair departments and are not alone interested in selling new equipment. If you are on an appropriation, you may be able to save something for that special piece of apparatus you have had on your mind for some time.

Buying second-hand or used equipment is rarely good business. You may occasionally get a good buy, but certainly do not buy a second-hand balance or microscope without exhaustive examination. The balance may have a chipped agate, hardly visible to the eye. Use alone may allow you to discover other defects. As for second-hand microscopes, have them examined thoroughly by an experienced microscopist.

"Where shall I buy?" you ask. The answer is: "From the house where you get the best quality, service and price." All regular supply houses are anxious to give you all of these and more, if possible. Your business is valuable to them. Visit laboratory supply houses more frequently, and get acquainted with their staffs. Many chemists would be better buyers if they had a more personal and human touch with dealers. Get the idea well out of your mind that this business is based on "soaking" and "stinging" methods. On the whole, you will find that all supply houses are out to give you what you desire most. Their interest and those of your profession are much in common.

SYRUP FROM SWEET CORN STALKS

That a good cooking syrup can be made from sweet corn stalks that can be put on the market and meet competition with molasses, and that the average corn cannery has available material for the making of from 30,000 to 80,000 gallons of this syrup per year, was the report made by Dr. J. J. Willaman of the Minnesota Section of the American Chemical Society at the recent convention of the Minnesota Canners' Association in Minneapolis.

Two years ago the Minnesota legislature made a special appropriation, at the instance of the canners and growers of sweet corn, for investigating the syrup making possiblities of sweet corn stalks as a by-product activity of the canneries. The investigations were concluded last summer by the Division of Agriculture Biochemistry, Minnesota Agricultural Experiment Station.

Besides finding out the best way of making a palatable syrup from the corn stalk juice, the investigators made a thorough study of the chemistry of the corn plant, working with five varieties of sweet corn and two of field. It was found that if the stalks are left standing after the removal of the ears for the cannery, there is a marked increase in sugars in the juice. In one case a sugar content of 17 per cent. was noted, which compares favorably with the juice of sorghum and of sugar cane. The sucrose purity, however, is too low for crystallization purposes, which would be necessary for making sugar.

"Since the best canners' varieties at the present time are not the best syrup varieties," Dr. Willaman said, "the next phase of these investigations is the breeding of a dual purpose corn—one that has a big stalk with high sugar content, and at the same time has a high quality ear for canning."

RUST-PROOF STEEL

France is responsible for a new kind of steel which lays claim to being rust-proof. This new "steel," the composition and qualities of which have been communicated to the Academie des Sciences by M. Le Chatelier, has recently been developed by Mr. Chafnard, Director of the Steel Laboratory at Imphy (Nievre). Into the composition of the new metal enter 60 per cent. nickel, 12 per cent. chromium, 2 per cent. manganese, 0.5 per cent. carbon. An alloy so far removed from commercial steel deserves a more distinctive name.

Chemical Society News

Containing Official Announcements of the Canadian Institute of Chemistry.

ANNUAL MEETING OF CANADIAN CHEMISTS, TORONTO, MAY 29TH, 30TH AND 31ST

Arrangements of dates have been made for the annual meeting of the Canadian Institute of Chemistry and the Society of Chemical Industry, on May 29th, 30th, 31st; at Toronto. On May 28th the Chemists' Committee of the Advisory Research Council will meet at Toronto. These dates allow those in attendance at the meeting of the Royal Society, in Winnipeg, during the week previous to arrive in Toronto in time for Chemical Society meetings.

NEW MEMBERS OF INSTITUTE

The following have been elected to membership in the Canadian Institute of Chemistry:

Fellow (F.C.I.C.)

Maitland C. Boswell, Ph.D., Associate Professor of Organic Chemistry, University of Toronto.

John Bright Ferguson, Physical Chemist, University of Toronto.

Associate (A.C.I.C.)

R. T. Wynne-Roberts, B.Sc., 20 Selby Street, Toronto, Ont.

PROFESSIONAL ENGINEERS OF ONTARIO HOLD MEETING

The first meeting of registered Professional Engineers of the province of Ontario, was held at Toronto on January 8th, at the Engineers' Club. The Council and President appointed under the Act, retired, and the first elected council took office. Some eighty members were present.

Brig.-Gen. C. H. Mitchell was in charge as the first president. A. W. Gray, M.P.P. spoke briefly, telling the members some of the history of the passage of the bill through the Ontario legislature. Offices are now open in Toronto with Mr. R. B. Wolsey as registrar.

Fine progress has been made in a few months. Up to January 6th, some 595 applications had been received, and the registrar reported that they were coming in at a very rapid rate.

On January 6th, the membership stood as follows:—

	Accepted.	Held over.
Civil Engineers	286	54
Mechanical "	38	24
Chemical "	14	—
Electrical "	90	27
Mining "	50	10

Each group has three representatives on the Council who pass on the applications for their particular group. The registration fee is ten dollars ($10.00) with an annual fee of five dollars ($5.00). Members have the sole right to use a seal, as provided, specifying membership in a particular branch.

New officers were elected. Mr. Willis Chipman, President, and F. P. Ewart, Vice-President. Both have been hard workers for the legislation and assure the Engineers that full legal professional status with penalty clauses can be secured.

Under the Act, each group elected two representatives. A third is appointed by the Government. The elected representatives from the Chemical Engineers' group for the coming year are: David J. Huether, Toronto and E. T. Sterne, Brantford. Chemists desiring to make application should address the registrar at 96 King St. West, Toronto.

PRELIMINARY FINANCIAL REPORT OF CANADIAN INSTITUTE OF CHEMISTRY FOR 1922

The following itemized statement of expenditures for the calendar year 1922 consists of two parts, of which the first covers the period from January 1st to May 24th. The second part covers the balance of the year.

The Treasurer does not guarantee the figures in the second portion to the last cent, since they have not yet passed through the hands of our auditor, but to the best of his knowledge and belief they are substantially correct.

The four month period from January 1st to April 30th always makes a heavy demand upon the Institute's revenue, the annual subscriptions to CANADIAN CHEMISTRY AND METALLURGY on behalf of our members being payable in January. The Treasurer hopes to keep the expenditures during this period within $1,200, provided no extraordinary calls are made on our funds.

Expenditures from Jan. 1st to May 24th, 1922 (from Mr. Harold J. Roast's statement):

Stenographic services	$210.00
Journal	518.92
Booklets	447.29
Rent and taxes	50.00
Printing and stationery	56.25
Telegraph and telephone	15.77
Postage	63.30
Travelling expenses and office expenses	113.82
Annual Dinner at Ottawa, including $10.00 for Palm Room	80.65
Delegate to International Chemical Union	200.00
Annual Subscription to International Chem.Union	93.50
General expense	87.25
Depreciation, 10%—6 months	25.90
Audit	35.00
	$1,997.65

Expenditures May 24th to December 31st, 1922:

Office equipment	$ 57.54
Printing and stationery	128.79
Postage	42.50
Secretary's stenographic allowance	320.00
President's and Treasurer's stenographic allowances	35.00
President's travelling expenses to Halifax	20.00
Secretary's travelling expenses to Kingston	12.45
Travelling expenses to September meeting of Council	82.80
Subscriptions of new members to Journal	19.50
Mr. S. J. Cook's report on remuneration of chemists	15.00
Stenographic report of annual meeting	97.80
Grant to Queen's University students' branch	10.00
Fee to Secretary of State	2.00
Express on books, etc., from Montreal office	7.69
Freight	1.63
Bank charges on cheques	2.15
	$854.85

Total expenses for calendar year 1922:

Jan. 1st to May 24th, as per Mr. Roast's statement	$1,997.65
May 24th to December 31st	854.85
Total	$2,852.50

Total income for calendar year 1922:

Annual dues of Fellows and Associates	$1,852.89
Entrance Fees of Fellows and Associates	195.00
Students fees	177.00
Grant from Advisory Council for International Chemical Union delegate	200.00
Bank and bond interest	33.76
Sales of Blue Book	1.00
Total	$2,459.65

E. G. R. ARDAGH, Treasurer.

THE LATE DR. JOHN WADDELL

In our January issue we referred but briefly to the death of Dr. John Waddell, associate professor of chemistry and librarian of the science department at Queen's University, Kingston, owing to the fact that his sudden demise occurred just as the journal was going to press. A sketch of his brilliant career is herewith given.

Professor John Waddell was born in Pictou County, Nova Scotia, 64 years ago, the son of Rev. James Waddell and Elizabeth Blanchard. He married Annie Maud Burrows, by whom he had two daughters. His education was received at Pictou Academy, and he graduated with B.A. degree at Dalhousie University, Halifax. Studies were continued abroad, B.Sc. degree being taken in London; Ph.D. at Heidelberg and D.Sc. at Edinburgh. He was Hope prizeman and Vans Dunlop scholar, at Edinburgh University. He became professor's assistant in chemistry at the latter institution, later becoming professor of science at the Royal Military College of Canada, leaving there to join the faculty of Queen's University, with which university he had been connected for over thirty years. Professor Waddell was a member of the American Chemical Society and of the American Association for the Advancement of Science, a fellow of the Canadian Institute of Chemistry, and a member of the German Chemical Society and of the Bureau of German Chemistry.

His published works include "The Arithmetic of Chemistry," "A School Chemistry," "Quantitative Analysis in Practice," and he is also the writer of numerous articles published in chemical and physical periodicals.

He was a member of the Frontenac Club of Kingston, and in church affiliation was a Presbyterian.

In addition to his widow, Prof. Waddell is survived by two daughters, Miss Lucy Waddell and Mrs. Richard Cargill, of London, England, the former being at present on a visit to the latter.

The late Dr. Waddell, accompanied by Mrs. Waddell, had gone to Montreal over the New Year holidays to visit at the home of the latter's brother, Dr. A. E. Burrows at Verdun, where he was stricken with pneumonia, which terminated fatally on January 5th.

L. H. NEWMAN APPOINTED DOMINION CEREALIST

L. H. Newman, secretary of the Canadian Seed Growers' Association, and a graduate of the University of Toronto and the Ontario Agricultural College, has been appointed Dominion Cerealist in succession to Dr. Charles E. Sanders, who resigned some time ago on account of ill-health. Dr. Sanders was the discoverer of "Marquis wheat," a discovery which not only enabled wheat to be grown one hundred miles further north, but also added many thousands of dollars to the national wealth.

Mr. Newman is very well known in connection with his work for the Canadian Seed Growers' Association, and has been identified with experimental and practical agriculture for many years. He is the author of the book, "Plant Breeding in Scandinavia."

THE ENGINEERS' TABLE

It takes 1,100,000,000,000,000,000,000,000,000 electrons to weigh a gram. Ain't they cute little rascals?—Journal of the Associated Engineering Societies of St. Louis.

AMERICAN LEATHER CHEMISTS 20TH ANNUAL CONVENTION

The American Leather Chemists Association will hold its twentieth annual convention at the Greenbrier, White Sulphur Springs, W.Va., on June 7th, 8th and 9th, next. Full information concerning details of the meetings, hotel rates and transportation may be obtained by addressing Mr. H. C. Reed, secretary, 22 East 16th Street, New York City.

PULP AND PAPER MEN HOLD IMPORTANT MEETING

The Technical Section of the Canadian Pulp and Paper Association held its annual convention at the Ritz-Carlton Hotel in Montreal on the 24th and 25th of January. The first session, on the morning of the 24th, was devoted to the usual business, including reports of the various committees, and was largely taken up by the report of the Committee on Education and the ensuing discussion. The pulp and paper industries of Canada and the United States possess the proud distinction of having prepared a set of text books (the last two volumes of which are not yet finished) on the manufacture of pulp and paper at a cost of $40,000. These books have received well-deserved praise from men eminently fitted to judge of their value; and the problem now facing the industry is how they can best be utilized for raising the standard of all classes of workers in the mills, from the superintendent down to the broke hustler and the men working in the yard. As far as Canada is concerned, the Institute of Industrial and Domestic Arts, Regd., has organized a correspondence school of pulp and paper making, which is acting in co-operation with a specially appointed supervising committee of the Canadian Pulp and Paper Association. The faculty is composed of practical pulp and paper men amongst the most experience in the industry. The short afternoon session was taken up by the reading of a paper by E. J. Trimbey on "Stock Saving—With and Without Save-Alls," in which the author emphasizes the importance of preventing loss of fiber at the source and then using the save-all to catch what gets by all other precautions, and a paper by Dr. E. A. Rees on "Functions of Press Felts," which describes tests which have been started by F. C. Huyck & Sons with a view to ascertaining the proper design of a felt to embody the desired properties of permeability to flow of water, cushion and softness as affecting the concentration of nip pressure. On Friday morning Dr. Bjarne Johnsen and H. N. Lee presented a paper on "The Properties of Wood in Paper Making," which dealt with cord measurement, density, rate of growth, cellulose content, decay, and seasoning, and their relation to the manufacturing process. This was followed by B. C. Ransom's paper on "The Manufacture of Printing Ink," which described modern printing ink manufacture, and showed that by proper co-operation with the ink manufacturer the printer should experience no difficulty in selecting an ink suitable for any given job, provided, of course, that the quality of the paper was right. The last session was taken up by a paper on "Steam Utilization in a Modern Newsprint Mill," by S. W. Slater and J. E. A. Warner, in which the authors analyzed conditions dealing with the selection of a prime mover, electric vs. rope drive for paper machines, paper drying, and ventilation requirements. The following officers were elected for the ensuing year: Chairman, O. F. Bryant (re-elected); vice-chairman, C. Nelson Gain; secretary-treasurer, Edward Beck (re-elected); councillors, A. P. Costigane, C. S. V. Hawkings, R. W. Hovey.

At the annual meeting of the Canadian Pulp and Paper Association on the 26th of January, the proposal to appropriate $30,000 for establishing an organization for scientific and industrial research and appointing a Director of Research, was put off for one year to enable the members to study the question still further. The committee in charge of the proposition was enlarged and instructed to continue its investigations and report to the members, so that at next year's convention a definite stand might be taken.

COLLOQUIUM ON FELDSPAR

At the Silver Jubilee Convention of the American Ceramic Society to be held at Pittsburgh, February 12th to 16th, a special colloquium will be held in feldspar classification and specifications.

THE VALUE OF RESEARCH CENTRES

On January 16th the Toronto Section, Society of Chemical Industry, had the pleasure of hearing an address by Dr. E. H. Howe, editor of the "Journal of Industrial and Engineering Chemistry." He spoke on "The Value of Research Centres." Dr. Howe has given considerable time and thought to the organization of research work along chemical lines in the United States.

At the commencement of his address, Dr. Howe gave several outstanding examples of what research work had accomplished, and also of the large sums of money now being spent by companies in furthering research work in their own industry. From Faraday's notable research in electrochemistry had sprung an industry owning over ten billion dollars of taxable property. From intensive research work had come the Madza Lamp, which, it had been estimated, had already saved over $400,000,000.

Continuing, Dr. Howe dealt with the question: "How to Initiate and Retain Research Work." First, there was the Individual method, as opposed to organized Research. Many were afraid of organized research, needlessly, for it had been shown that organization does not destroy the individuality of the research worker. A centre of research took nothing away from the research genius, but, on the contrary, helped him to a considerable degree, especially by his contact with men in other fields. Centres of research also attracted support, financial and otherwise. The speaker did not favor Research Professorships, mainly because the research work had to take second place to administrative duties. Industrial research very often leaned too heavily on the university, when it would much better be conducted in a plant or a laboratory maintained by the company wanting and carrying on the research. Research Fellowships were a very favorite plan, but too often the professor received but slight remuneration for the time and attention he had to give to such students. The Fellowship plan has worked out well in the case of the National Lime Association.

Co-operation with Government Laboratories was a method sometimes adopted. The plan of bringing in a consultant to carry on or direct research work in a plant also worked out well, but only where one problem was involved. Both these methods were not suitable for any sort of continuous research work.

The American Bakers' Association was referred to as a splendid example of initiating research work. This Association, consisting of 26,000 bakers, has erected the American Institute of Baking, at Chicago, where research work is conducted, and young men are trained in the chemistry of the industry.

The National Laundry Association began their research work by giving Fellowships, but are now erecting a laboratory of their own, where the problems of the laundry industry may be solved, better methods established, and men trained.

The General Electric Company, Eastman Kodak Co., American Telephone and Telegraph Co., and industrial associations, such as those referred to, had all initiated and carried on research work, and proved that the best method was for the companies in an industry to co-operate and establish an institute, or, if a company had enough funds, to establish its own research plant.

The financing of research work was next dealt with, and Dr. Howe briefly outlined a few schemes in vogue. In the case of industrial associations, a tax may be levied on equipment, as, for example, the National Cotton Manufacturers' Association levies a tax of one cent per spindle on all its members, and, in this way, has an annual revenue for research work of over $300,000. The tax may be levied on the average number of employees, sometimes on the capital stock of each company, sometimes on the value of production. Then, there was the revenue obtained from private funds, which was often a considerable amount. "Any or all of these methods are better than seeking Government support," said Dr. Howe. The Government should work on those problems affecting a large number of industries. Five million dollars was appropriated this year by the United States Government for research work. The National Research Council was doing a good work, by bringing one group in contact with another.

In conclusion, Dr. Howe referred to the passing of the type of executive who prided himself on the "trade secrets" that his company possessed. The Iron Founders of the United States had not only pooled their resources, but had also published their so-called "trade secrets," and every firm had benefitted and the industry advanced. Chemists and science men generally should take every opportunity of appearing before "laymen," telling them about chemistry and, in this way, create a sympathy and knowledge among the public that would support any Government movement for advancing science.

A very interesting discussion followed Dr. Howe's address, in which several members took part. Professor Harcourt, of the O.A.C., Guelph, informed the meeting that a short course for bakers had been instituted at the Guelph College, which would be attended by a class drawn from the large bakeries of the province.

Dr. M. C. Boswell, of the School of Engineering Research, University of Toronto, said that an increasing number of men were returning each year for research work, and he was confident that the movement had justified itself. He had been glad to hear the many valuable ideas put forward by Dr. Howe.

Mr. C. Price-Green, Commissioner, Industrial and Resources Department, Canadian National Railways, said that the railways were vitally interested in research work, as to the extent the resources and industries of the country were developed, depended the expansion of the railways.

Others taking part in the discussion were: Dr. Lash-Miller; Professors E. G. R. Ardagh and Kenrick; Mr. E. T. Sterne, of Brantford, and Mr. W. P. Schorman.

The chairman, Mr. L. E. Westman, presided.

LIQUID HELIUM PRODUCTION AT THE UNIVERSITY OF TORONTO

The production of liquid helium marks a distinct step in the development of low temperature equipment in the Physics Department of this University. Prof. J. C. McLennan has been on this line of work for some considerable time, and put in a liquid air plant several years ago. Following the extraction of helium from Western and American natural gases, and the great efforts of the War Department to provide the gas in quantities, the University was able to secure a supply which will be ample for their requirements.

In 1908, Kamerlingh Onnes, Professor of Physics, at Leiden, Holland, first produced Liquid Helium. His laboratory is the most noted in Europe for low temperature work. During the war, this was discontinued, but, since that time, new equipment has been put in, and about once a year, liquid helium is produced.

Prof. McLennan desired to duplicate this equipment in America, and during the past three years, has been developing and erecting a most complete set of equipment for large-scale work. He has introduced some new and special features in design, control and safety precautions, and, in all of this work, has been ably assisted by Mr. G. M. Shrum.

As a result, the University now has a plant of good capacity, worth several thousand dollars, ready to produce liquid helium and by hydrogen, in quantities that will allow for large-scale experimentation on any problem where low temperatures are required. It is a unique equipment in America, and probably exceeds in capacity any other equipment of this kind. The experimental liquid air plant has a capacity of sixty gallons of liquid air per day. The specially designed, large, four-stage hydrogen compressor has a capacity of ten litres of hydrogen per hour, and sufficient helium is available. During the development of this work, the lack of experience of engineers, assistants and all concerned has made progress rather slow, but great credit

is due those who have met and solved the problems. The whole plant is now under perfect control, and production might be said to be on a factory basis, as far as such operations involving high pressures and low temperatures can be arranged.

Liquid helium has been made on two occasions to date. First, a very considerable quantity of liquid hydrogen is produced, and, from this, in a specially designed piece of apparatus, the liquid helium is made, at the expense of expanding hydrogen as this is injected. In the first run, some twenty litres of liquid hydrogen were necessary to produce one litre of liquid helium, but, on the second, it took only ten litres of hydrogen to produce one litre of helium. The capacity of the equipment, running continuously, is estimated at two litres per hour, although the single litre produced came down in about fifteen minutes.

The boiling-point of liquid helium is —269°C., and the colorless liquid is rather difficult to observe, because of the indistinct meniscus. The greatest purity is necessary in the hydrogen. This must not contain more than one-twentieth of one per cent. impurity of any kind, and it takes at least 2000 cubic feet, at this purity, to get started. Special equipment has been designed to purify the hydrogen at various stages. The tubes through which the gases pass are so small at some stages that any freeze-up would mean a shut-down.

The Department of Physics is particularly well equipped to undertake spectroscopic work, and it is planned to follow this, as one line of research, working at these low temperatures. The difficulty of the Doppler effect will be avoided, as the lines will all be very clear. Work on magnetism and super-conductivity will also be followed. Arrangements have been made to maintain continuous operations by transfers of receiving vessels. So far, this has not been done. The units, taken together, make a remarkable addition to the scientific equipment of the University, and bring further credit to a Department of Physics already noted throughout the world for its experimental facilities.

THE CHEMICAL INSTITUTE IDEA HAS ARRIVED IN UNITED STATES

The American Institute of Chemistry was organized at a meeting of local New York chemists at 381 Fourth Avenue, on January 22nd. This new society aims to include only chemically trained men who measure up by education and experience to the qualifications set for membership.

It will function along the same lines as the Institute of Chemistry of Great Britain and the Canadian Institute of Chemistry, which have been successful in giving to the vocation of chemistry a professional status by recognizing only those as entitled to be called chemists who satisfy certain standards of capacity.

The American Institute of Chemistry will seek to perform for the qualified chemist the same service as that of the Bar Association for the lawyer and of the Medical Society for the physician.

Dr. H. C. Byers in charge of the department of chemistry of Cooper Union, and Dr. Lloyd Van Doren, a chemical patent lawyer, both John Hopkins graduates, are respectively president and vice-president. C. K. Simon, president, Dye Products & Chemical Co., 200 Fifth Avenue, New York, is treasurer. The secretary is Lloyd Lamborn, editor of "Chemical Age."

IMPORTANT LEATHER MEETING

Dr. George D. McLaughlin of the Department of Leather Research, of the University of Cincinnati, will be present at dinner, and afterwards address an open meeting of the Toronto Section, of the Society of Chemical Industry, on Friday evening, March 23rd. Professor McLaughlin is a leading authority in the United States on leather and tanning problems, and has undertaken a wide series of researches for the Tanners' Council.

Everyone interested in tanning and the leather business, should plan to attend this meeting, and communicate with Mr. H. E. Rothwell, Secretary, 57 Queen St., West, Toronto.

PERKIN MEDAL AWARDED TO DR. M. C. WHITAKER

The Perkin medal presented annually for the most notable achievement in applied chemistry, was presented to Dr. M. C. Whitaker, vice-president of the U.S. Industrial Alcohol Company and a director of the American Chemical Society. The award was given to Dr. Whitaker primarily for his recent work in completing researches, building first an experimental plant and then a modern industrial unit for the continuous production of ethyl acetate. Ethyl acetate is used as a solvent in the manufacture of artificial leather, plastics, varnishes and laquers, aeroplane dope, smokeless powder, artificial silk, perfumes, flavoring extracts.

In his paper of acceptance of the Perkin Medal, Dr. Whitaker described the work of the organization of the U.S. Industrial Chemical Company, of which he is president, in converting a plant hastily erected at Baltimore during the war into an efficient experimental plant.

"Our problem was to work large volumes of dilute acetic acid varying in concentration from 0% to 15%," he said. "Old standardized methods and materials were not available to us. Some new light had to be thrown on the chemistry of esterification and the product of these reactions."

Intensive researches resulted in the discovery that sulfuric acid, in very low concentrations, is an excellent catalyzer, or accelerator, and reduces the time required to complete the reaction to 150 minutes.

He also described the experimental plant built from some war equipment and "junk" as "far from mechanically perfect and it leaked." Nevertheless, the unit operated for some months at a profit. It was the model on which a large scale plant, and then a second unit, were built. They now produce anhydrous, chemically pure ethyl acetate by continuous esterification of dilute acetic acid at the rate of 150,000 gallons per month.

Dr. Whitaker further said: "It has been my good fortune to be an organization man rather than an individual worker. Achievements which have resulted in the award of the Perkin Medal to me are necessarily, therefore, achievements of the men with whom I have worked. Accordingly the medal is accepted by me in a representative capacity as a distinguished honor conferred on these men with whom I have been associated in the thirty years devoted to study and practice in the field of applied chemistry."

Dr. Whitaker was for six years editor of "Industrial and Engineering Chemistry," and from 1911 to 1917 was professor of chemical engineering at Columbia University.

SPECIAL LECTURES ON CHEMICAL PLANT EQUIPMENT

The University of Toronto is securing Mr. F. M. Turner, Jr., of the Chemical Catalog Co., Inc., for a series of lectures on Chemical Plant Equipment. As a technical editor, Mr. Turner has made a particular study of this type of equipment, and the course should be a valuable supplement for students in chemistry and chemical engineering. The local branches of tho Society of Chemical Industry and the Canadian Institute of Chemistry are co-operating with the University, and resident chemists interested should attend this course. It is slated for February 26th to March 3rd, and will consist of six lectures, well illustrated.

CIVIL SERVICE POSITIONS.

A chemist-pharmacologist is wanted for the Medical Research Division, Department of Health, Ottawa. Salary, $3,480.

Also laboratory assistants, salary $900, for Department of Agriculture. Applications must be in not later than March 1st. Write Civil Service Commission, Ottawa.

WORLD CONDITIONS AND NEWS IN CHEMICAL FIELDS

Special Correspondence to Canadian Chemistry and Metallurgy by our London Representative

AUSTRALIA

Labor Troubles Destroying Australian Mineral Industry

The effect of industrial troubles upon the mineral industry of Australia during the last three years, is disclosed in a recently issued statement compiled by the Australian Metal Exchange.

The figures show that while in 1918 the production of lead and zinc concentrates was 608,502 tons, the total for the whole of the succeeding three years was only 609,229 tons, or an average of 203,076 per annum.

While the production of pig-iron increased from 200,253 tons in 1918 to 352,365 tons in 1921, this industry has practically ceased operations since the beginning of 1922, owing to overseas offerings of pig-iron and steel products at prices with which Australian producers cannot compete even in their own domestic markets.

GERMANY

Shrinkage of Iron

Prof. Wust has designed a new shrinkage meter to record the behavior of temperature on iron, as regards length, etc. He presented his paper to the German Iron Foundry Society.

Carbon reduced the shrinkage of pure iron from 2.4 per cent. to a minimum of 1.9 per cent., and with increased concentration, shrinkage also increases. Phosphorus and silicum act similarly to different degrees, while manganese has an opposite action, shrinkage being increased to 15.5 per cent., with sufficient concentration.

Glass Instrument Industry

Arrangements have been made that glass tubes manufactured by Schott & Genossen in Jena, Gustav Fischer in Ilmenau, and Greiner and Friedrich in Stutzerbach, shall be sold only to members of the Union of German Factories for Glass Instruments, in Ilmenau, and the Union of Thermometer and Glass Instrument Factories, in Roda.

Caustic Soda

For the year ending April, 1922, Germany imported 2,400 metric tons of caustic soda, valued at 48,000,000 marks, over one-half of which came from the United States, and over one-third from Great Britain. The large imports are caused by the soap, glass and chemical factories trying to maintain capacity production.

Potash Industry

The production of the German Potash Mines, for the first half of 1922, amounted to 5,893,711 tons, or 682,787 tons of pure potash K_2O. 1,996,970 tons of potash products or 526,713 tons pure potash were sold between January and June.

In December, 1921, the Potash Syndicate sold 4,893,709 Doppelzentner of crude potash, equivalent to 1,265,160 Doppelzentner of pure potash (K_2O). German industry and agriculture took 4,032,404 Doppelzentner of potash. The remainder was exported. The U.S.A. and Holland took the bulk of this. Sales throughout 1921 on the home market amounted to 31,811,184 Doppelzentner of potash, equivalent to 7,685,050 Dz. of pure potash. Exports amounted to 5,636,131 Dz. of potash, equivalent to 1,526,419 Dz. of pure potash.

The following table gives comparative figures of sales of pure potash during the last few years:—

	Total sales Doppelzentner	Exports only, Doppelzentner
1921	9,211,469	1,526,419
1920	9,246,517	2,345,215
1919	8,120,168	1,746,768
1918	10,017,552	1,412,942
1913	11,103,694	5,060,866

The bulk of the potash production went to agriculture, while industry took quantities which grew smaller from year to year. In 1919 agriculture took 6.09 million Dz. out of a total of 6.37 million Dz., while the remaining .28 million Dz. went to industry.

German potash exports were always of importance. The following table shows the quantities taken by various countries in Dz. pure potash:—

	1913	1914	1919	1920
North America	2,482,943	1,623,738	701,288	646,142
Holland	436,735	424,151	306,990	547,494
France	424,369	253,739	.....	19,748
Scandinavia and Denmark	341,341	392,146	560,103	309,920
Great Britain	294,192	139,245	102,786	88,414
Austria-Hungary	283,012	268,415	24,339	272,651
Russia and Poland	245,677	164,752	625	311
Belgium	152,345	114,806	1,156	106,049
Spain	83,550	32,150	3,587	20,835
Italy	73,204	57,834	.....	22,695
Switzerland	34,779	42,841	31,996	31,293

The decrease in the American purchases is due partly to the present slump, but mainly to the competition of the Alsatian potash mines.

In December, 1921, exports were highest since August, 1920, and there are some hopes of an increase in exports in the future, though the developments in American tariff legislation have considerably darkened the prospects for a rapid improvement in that direction. Another point that tells against the German makers is that the French potash works offer their potash abroad at prices below those quoted on the French market. The German Potash Syndicate has adopted the opposite policy and is hoping that Alsatian producers will come to an agreement with German producers as regards prices.

Important changes have occurred in the German potash industry in the last few months, and others are pending. There are now twelve large concerns, the largest of them being the Deutsche Kaliwerke, which controls thirty shafts and ten factories. The Wintershall-Alexandershall concern ranks second, with twenty-eight shafts and ten factories. Then comes the Burbach-Krugershall group, with twenty shafts and nine chloride of potassium factories.

The Steel Industry in South Africa

Before 1918, there was practically no steel produced. In 1918 two furnaces began smelting domestic ore. In May, 1920, a Company was organized to manufacture pig iron and steel on a large scale at Pretoria. This corporation received Government contracts, but the development is still in the promotion stage. There is a company at Newcastle, Natal, producing 140 tons of pig iron daily, and a steel plant at Vereeniging, Transvaal. A 25-ton Siemens open hearth basic furnace was erected in 1921. Most of the small works using scrap iron have been discontinued, and the outlook for any large operations is not immediate. The necessary ores are available.

Dye Making in Russia

Newspaper reports do not give a very clear conception of Russia at present, from an industrial angle. Everything has by no means been destroyed, and the Bureau of Aniline Manufacture has several factories turning out dyestuffs. A return of private ownership in a form will find much machinery put in operation in a remarkably short period. The Government is giving very fair treatment to industrial visitors and agents of large business houses and transportation companies.

AUSTRIA

Galalith

One of the most interesting products at the Vienna Autumn Fair was Galalith, a product of varying hardness, according to its use, which can be effectively colored. It has proven a good substitute for many foreign substances and may be used for buttons, combs, umbrella and other handles, penholders, writing-table materials, ornaments, electro-technical goods, piano keyboards and many other things not yet attempted.

The hardening process of the substance for heavy plates and bars requires much time, as does the coloring process. Being a product of casein, a product used for nourishment by the German people during the war, Galalith has now been allowed

to develop until recently. It is, however, the belief of the makers that it is no longer a substitute, but a raw material, essential to many industries. Among the ways it was displayed at the Vienna Fair was in watch-cases, where it took the place of metal. Its resemblance to tortoise shell places it as a horn product.

WEST INDIES

Industrial alcohol is being manufactured for use of motors, etc., in Jamaica.

North American Aluminum Co. will shortly resume active operations of the bauxite fields of British Guiana.

Logwood Industry

British capital is interested in the fourth factory for the production of logwood dye in Jamaica. A first shipment has been sent to the United Kingdom.

The logwood industry is among the leading industries of Haiti, the United States being the chief customer. The exports from Haiti for logwood show:—

Year Ending Sept. 30	pounds
1919	77,393,337
1920	242,157,599
1921	74,893,411

The drop in 1921 is due to general business depression.

SOUTH AMERICA

Nitrate

Chile produced 447,197 tons of nitrate for the first half of 1922, a little more than one-half of that produced in the corresponding period in 1924. Exports amounted to 279,034 tons, as compared with 785,362 tons in the first six months of 1921. The United States imported one-half the production, the remainder going to Egypt and Europe.

The estimated consumption for the same period amounted to about 900,000 tons. 217,500 tons were held in Europe and Egypt, and Chile and factories held 1,600,000.

Iodine

The value of the iodine exported from Chile in 1921 was 9,991,132 pesos, compared with 21,628,000 pesos in 1915. New uses for the chemical are sought.

Rubber

In 1905, the exports of raw rubber from Brazil amounted to £14,900,000, while in 1921 they had fallen to £1,230,000, the fall being due to the competition and over-production.

Manganese

Only 25,000 tons of manganese were shipped in January and February this year. Lower prices and the return to activities of eastern markets, along with greater production in the United States, are the chief reasons for the decline. An optimistic view of the situation is taken by the British Chamber of Commerce, who predict only a temporary decline, but look for a great demand of Brazilian manganese in the near future.

CHINA

Antimony

In 1920, China exported 1,375 tons of antimony to Great Britain, compared with 4,000 tons in pre-war years, while the United States took 7,500 tons of China's total of 12,000 for the same period. The export for the United States continued above the average in 1921 and the first part of 1922, the automobile trade, the hard lead trade, and the type metal manufacturers buying large quantities.

ITALIAN SULPHUR

According to a statement issued by the Italian Minister of Agriculture on the production of minerals in Italy in the year 1920, the 1920 output of sulphur is given as 296,099 tons only, as against 2,452,474 tons in 1913. The 1920 production, however, is larger than that of 1919 by 13,783 tons. The value of the sulphur produced in 1920 amounted to 172,700,720 lire. Apart from lignite, this is the highest value representing mineral production in Italy.

MINING AND METALLURGY IN BRITISH COLUMBIA

Value of B.C. Mineral Production, 1922 30 Per Cent. More Than For 1921

The beginning of the year always is a season for retrospect, and now that the large mining and metallurgical companies have issued estimates of their production for last year, it is possible to make a fairly accurate estimate of the mineral production of the Province for 1922. The Consolidated Mining and Smelting Company has smelted almost as much ore from the State of Washington during the year as it has from the Slocan and Ainsworth districts, which are the principal lead and zinc districts of British Columbia; but, on the other hand, a considerable amount of ore from the Slocan district was smelted in the United States. In making an estimate of the production of the Province, therefore, these factors have to be balanced against each other. The following estimate, it is believed, will closely approximate the mineral production of British Columbia for 1922. The production for 1921 is given for comparison:—

	1922		1921	
	Quantity	Value	Quantity	Value
Gold, oz.	225,000	$4,650,750	147,293	$3,037,354
Silver, oz.	6,750,000	4,522,500	2,673,389	1,591,201
Copper, lb.	30,000,000	4,005,000	39,036,993	4,896,624
Lead, lb.	80,850,000	5,316,950	41,402,228	1,693,354
Zinc, lb.	53,570,000	2,999,924	49,419,370	1,952,065
Coal, tons	2,559,414	12,797,070	2,843,995	12,419,975
Coke, tons	40,837	408,370	59,434	416,038
Miscellaneous	.....	2,300,000	.....	2,077,030
Total		$36,990,560		$28,066,641

It will be seen that the estimated value of the production is nearly 30 per cent. more than the value of the production in 1921, and that, with the exception of copper, all metals show a substantial increase, while the increase in the value of the lead and silver production is very marked. In the case of lead, of course, the increase is partly due to the increased value of the metal, but the actual production of metal was 75 per cent. more than in 1921.

Premier Mine Now Largest Silver Producer in Canada

The increase in the gold and silver production is due entirely to the marvelous production from the Premier mine, which to-day is the biggest silver producer in Canada, while the increase in the lead production is mainly due to the other wonder mine of the Province, the Consolidated Mining and Smelting Company's Sullivan mine. The character of the ore of this mine has been changing steadily, the zinc content diminishing and the lead content increasing. The revival of mining in the Slocan and Ainsworth districts has materially contributed toward the increases in the lead and zinc production.

Increased Use of Fuel Oil Lowers Demand For Coal

To all intents and purposes the coal mining industry has remained stationary, despite a general improvement in nearly all other industries. Many of the trans-Pacific and coastal service steamships have been converted from coal burners to oil burners, while many industrial concerns that used to use coal are now using oil for fuel; the result has been a sharp falling off in the demand for bunker coal and for coal as an industrial fuel. There has been much labor unrest in the coalfields of the Province, particularly in the Crow's Nest Pass coalfield, in recent years, and this has been instrumental in raising the price of coal to such a degree that now it is unable to compete for many purposes with either fuel oil or electric energy.

Good Prospects For 1923

Turning from retrospect to prospect, never before probably, has the mineral industry entered upon a new year more auspiciously. The truly wonderful output of the Premier mine has caused it in a year to jump from obscurity into world prominence. It has attracted the attention of capitalists in all parts of the world, but particularly in the United States, where there is much idle money, and if fair terms are offered there is no difficulty in obtaining capital for the development

of prospects that promise to give a reasonable return for the investment. The coming year will see an enormous amount of exploration in the northwest part of the Province, where the geological conditions, which have been ably described by S. C. Schofield and G. Hanson in a memoir entitled "The Geology and Ore Deposits of the Salmon River District of British Columbia," recently issued by the Canadian Geological Survey, give promise that other mines of the Premier and Dolly Varden class may be discovered. But it is not only on the promise of new discoveries that the new year opens so favorably. The Britannia Mining and Smelting Company will have its new 2,500-ton concentrator in operation early in the year, and this alone should assure of the doubling of last year's copper output. The Consolidated Mining and Smelting Company is expected to have the new 1,500-ton concentrator at its Sullivan mine in operation by midsummer, at the latest, and this will add 50 per cent to the lead and zinc output, besides releasing the 1,000-ton concentrator at Trail for the treatment of the Company's Rossland mines ores, which should add in the neighborhood of 40,000 ounces to the gold output and 5,000,000 tons to the copper output of the Province yearly. There has been a consolidation of the principal gold properties in the Sheep Creek district, which should mean greater efficiency, and at the present time there is a bright propect that at least one or two dredges will be put into operation in the Cariboo district. Thus, it will be seen, the year has opened with a very rosy hue.

Output of Premier Mine

H. E. Guess, vice-president and managing director of the Premier Gold Mining Company, has announced that, approximately, the output of the Premier mine for last year was 137,000 ounces of gold and 4,500,000 ounces of silver, the value of which may be placed in round figures at $5,750,000, or about one-sixth of the value of the mineral output of the Province. The Company disbursed $2,750,000 in dividends during the year. As it is employing on an average only about 250 men, it will be evident that, despite heavy capital expenditure, the Company is accumulating a handsome money reserve, besides paying a rate of interest on its capital that never before has been approached by any mining investment in British Columbia. The capital of the Company is five million dollars.

Latest Mining Company News and Developments

Glenville A. Collins, president of the Drum Lummon Mines, Limited, which is developing a property on Hartley Bay, has announced that the Company will commence regular shipments of ore to the Granby smelter, at Anyox, and will ship between two and three thousand tons or ore monthly. The ore is a high-class copper, containing small quantities of gold and silver. The Company has expended some $60,000 on the development and equipment of the mine and in the construction of a wharf.

The Standard Silver Lead Mining Company has installed an air compressor, driven by a pelton wheel, at the McAllister mine, in the Slocan, to hasten the driving of a 1,500-foot tunnel, to cut the ore-shoot at 450 feet below the present bottom workings. The Standard Company has an option on a large block of the stock of the McAllisterCompany. The Standard mine, which was sold some 18 months ago, has reverted to the Standard Company, the buyers failing to fulfil their contract. Recently a large tonnage of zinc concentrate, which had accumulated at a time that there was no market for it, has been shipped to Trail, where, under the new zinc schedule it realized in the neighborhood of $35 per ton.

General R. G. E. Leckie and Messrs. Trites, Wood and Wilson, of Fernie, are opening a gold property at Wind Pass, 4,500 feet above Chu Chua, near Kamloops.

George Wingfield, of Reno, Nevada, former president of the old Dolly Varden company, is now in full possession of the Dolly Varden mine, the time given to the Taylor Mining Company to redeem the property having lapsed. Mr Wingfield foreclosed a mortgage that he held on the property.

A strike of rich silver ore is reported to have been made in the Baldy tunnel at the Experanza mine, near Alice Arm. Some 300 tons of ore has been shipped from this mine to the Granby smelter, at Anyox.

The following British Columbia mines paid dividends during 1922: Premier Gold Mining Company, $2,750,000, equal to 55 per cent.; Crow's Nest Pass Coal Company, $372,666, equal to 5 per cent; Silversmith Mines, Limited, $75,000, equal to 20 per cent.; Belmont Surf Inlet Mines, Limited, $62,500, equal to 2½ per cent.; and Surf Inlet Gold Mines, Limited, $23,522.50, equal to 1¼ per cent. The foregoing list includes all the more important companies with the exception of the Consolidated Mining and Smelting Co, who have not, up to date of mailing this news letter, announced their last quarter dividend.

Equitable Trust Co. vs. Canada Copper Corporation

The Equitable Trust Co., New York, holding debentures to the amount of $2,500,000 in Canada Copper Corporation, has filed a writ in the Supreme Court of British Columbia, asking that a receiver be appointed to wind up the affairs of the Company, and that the Trust Company be adjudged to have first lien on all the assets of the Corporation. The Canada Copper Corporation was a reorganization of the British Columbia Copper Company, who owned mines and smelter at Greenwood and had opened up the new development at Copper Mountain, 12 miles from Princeton. The Corporation continued the development at Copper Mountain, erecting a 2,000-ton concentrator at Allenby, and claims to have eleven million tons of copper ore averaging 1.75 per cent. in copper, and small gold and silver contents. The concentrator was closed down after only a month's operation in 1920, and has remained idle ever since, as the Corporation claimed that operation could not be successful with copper at the low price prevailing since 1920.

Output of Trail Smelter

The total value of the output of the Consolidated Mining & Smelting Company's smelter, at Trail, for 1922 was $9,092,257, compared with $6,836,420 in 1921 and $7,326,925 in 1920. The considerable increase in the value of the output last year was due almost entirely to the great increase in the lead production. Owing to the strike in the Crow's Nest coalfield and the consequent shortage of coke at Trail, the copper smelting and refining department of the smelter was closed early in the year, and the furnaces were not blown-in again during the year. The output of copper and gold, therefore, is smaller than it has been for many years, most of the gold in past years having been obtained from the Rossland gold-copper ores.

The following are the productions of the various metals for the year, the December output being estimated.

	Quantity	Value
Gold, ounces	18,928	$ 395,858
Silver, ounces	1,955,183	1,333,347
Copper, pounds	1,244,000	99,010
Lead, pounds	84,044,000	4,124,335
Zinc, pounds	55,703,000	3,121,680

In 1921 the company produced 56,334 ozs. of gold; 1,198,114 ozs. of silver; 3,056,910 lbs. of copper; 57,683,328 lbs. of lead; and 52,899,159 lbs. of zinc.

Granby Co. Secure Control of George Claims

What locally is considered to be the most important deal that has taken place since the Guggenheim interests secured control of the Premier mine is the bonding of the George group of twenty claims by the Granby Consolidated Mining, Smelting & Power Company. W. B. George has been developing this

property steadily for a number of years, and several companies have examined it before,—the Granby itself included—with a view to purchase. The property, however, is situated at the head of the Bear River, some eighteen miles from Stewart, and in the past its inaccessibility has deterred engineers from recommending its development. The claims are located on the side of a mountain, ideally situated for mining development, and three well-defined lodes have been traced by trenching and surface stripping up the mountain side. The lodes range from three to fifteen feet in width, and carry from three to sixteen per cent. of copper, with small gold and silver values. The Portland Canal Short Line railway, which was built in the boom days of 1912, runs to within six miles of the property, and this could be repaired and extended to the property, should the exploration that will be done next season prove the values found on the surface persist at depth.

Consolidated M. & S. Happenings

The Consolidated Mining & Smelting Company has entirely suspended operations at its Rossland mines. For some time the company has been doing only development work on the Rossland properties, as it has been demonstrated that it is more economical to concentrate the ore before smelting. It is probable therefore, that the mines will be closed until the new concentrator that is being built at Kimberley is finished. This will release the 1,000-ton concentrator at Trail, which now is being used to treat the Sullivan mine ore, for the Rossland mines ores. Douglas Day, general manager of the Le Roi No. 2 mine, which has a similar class of ore, finds that a preliminary light roasting greatly facilitates concentration and a much higher grade of concentrate is obtained. The light roasting appears to break up the pyrrhotite, or some of it, without appreciably affecting the chalcopyrite, which carries most of the gold. This fact was discovered accidentally in treating old dump material. It was found that oxidized ore yielded a much higher-grade concentrate, and Mr. Day naturally assumed that artificial oxidation would bring about the same result, and so it proved.

The Consolidated Company has closed its Rock Candy fluorite mine and mill, at Lynch Creek, owing to the railway shopmen's strike in the United States, which has caused a shortage of cars and made it impossible to transport the ore to Gary, Indiana, where nearly the whole of the output of the mine is marketed.

During the first six months of this year the Consolidated company produced about forty-five per cent. more lead than during the corresponding period of last year. This is due to increased mining activity in the Kootenays. The zinc output is about the same, but the gold output is considerably less, on account of cessation of production at the Rossland mines.

Mining the Kootenays

The Silversmith Mines, Limited, is installing an auxiliary Diesel engine power plant for use during extremely cold weather, when there always is a danger that there will not be sufficient water to operate the plant at capacity. The company is adding an American filter and another dewatering unit to its equipment, and it is building a new boarding house.

The mill at the Ottawa mine was destroyed by fire on September 5th. The cause of the fire is not known, but it is thought that it may have started through ignition of the flotation oils. These appear to be a source of danger in flotation plants. The mill was built last year at a cost of $40,000, and was put into operation last fall, and since then has recovered just about $40,000 worth of concentrate from the waste dump of the mine. There was $25,000 insurance on the plant.

Some splendid ore-bodies have been developed at the Florence mine, near Ainsworth, and the mill is being operated at capacity. A ten-ton experimental plant has been erected at the King Jack mine, Lemon Creek, also in the Ainsworth district.

Frank Woodside and associates of Vancouver are developing the Nip and Tuck mine, in East Kootenay, and are finding some excellent gold ore. The veins run up to four feet in width, and assays have ranged from $120 to $560 per ton. A large tonnage of ore has been blocked out, and two carloads are ready for shipping; roads to the mine, however, will have to be repaired before a shipment can be made.

What promises to be an important new gold strike has been made at Hills Bar Creek, near Hope, some seventy-five miles east of Vancouver. There are three veins, four to fifteen feet wide, carrying free gold and chalcopyrite, and grab samples have given assays up to $1,380 per ton. The find has attracted the attention of capitalists, and engineers representing the United States Mining, Smelting & Refining Company; the Anaconda Copper Company, and the Guggenheims have visited the property.

Timmins Brothers, the well-known Ontario mine operators, have bonded the Engineer mine, at Atlin, subject to the Privy Council upholding the decision of the British Columbia Supreme Court, which awarded the title to the property to the heirs of the late Captain James Alexander. The Engineer has produced some of the richest ore that has been found in the Province, though very little exploration has been done on the property. The mine has been in the courts almost continually since 1917, when Captain Alexander and engineers, who had been to examine the mine for the Mining Corporation of Canada, lost their lives in returning from the mine in the Princess Sophia.

THE EQUIPMENT GROUP IDEA AMONG CHEMICAL MACHINERY COMPANIES

The Chemical Equipment Manufacturers' Association of the United States, through its Secretary, Mr. Roberts Everett, has recently issued a general statement developing the ideas of the Association, and pointing out some modern tendencies of organization work along these lines. The aims of such an organization are the expanded aims of an individual firm manufacturing a specialty.

It is but a short step to conceive of the equipment manufacturer as an active agent in the development of his customers' or his prospective customers' affairs. Among the logical activities of an equipment association are market expansion and educational market cultivation. Under market expansion, come negotiations regarding export trade, and the distribution to members of domestic market information. Many phases of market expansion are possible—even the question of reaching the public in a broad way.

Some of the immediate aims of this Chemical Equipment Association are to collect and disseminate information as to design, raw material and construction, and promote a better knowledge of conditions controlling the industry's development. Research work and standardization are to have their place. One big objective will be the prevention of trade abuses.

In the few industries which have been fortunate enough to develop trade associations at their supply and equipment ends, these associations have won a rapid esteem for the constructive influence they have exerted. An authoritative report to one industry in which such an equipment association exists, an industry in which certain unfortunate conditions prevailed at uts inception, has cited that the association "in two short years has done very much to change the general conception of the industry from that of something undignified to something dignified, important and progressive." In another very important industry, the activities of an equipment association, through certain standardization work and the adoption of certain general policies of relationship toward the using industry, have automatically saved the latter amounts perhaps incalculable over a number of years.

Nor is it to be concluded, because in its method the nature of equipment forces the employment of a new idea, that in its

results to its own members an equipment association proves negligent.

In return for its constructive interest in the industries which its members supply, those members attract an invaluable good will, an identification that goes beyond the merely commercial. Their association automatically becomes a receiving station of invaluable trade news, of business to be placed, of activities pending, that is cleared to them for immediate and confidential use. Their committees' findings in investigations of trade matters, their officers' contact with government officials and agencies, give its members inevitably informational assets and aprestige of position that bring directly traceable—and often many fold—returns.

That, due to the activities of equipment groups using industries, themselves expand appreciably, has been demonstrated in a number of fields. In such expansion, it is only natural that the informational assets and the prestige of position which the members of the organized equipment members enjoy, give them some advantage in the new equipment business that results.

The establishment of a chemical equipment association is an advance step, and one which should result in miuch benefit to users throughout the United States and Canada. The idea is sound, and should be assisted in every way.

NEW BOOKS REVIEWED

"Some Physico-Chemical Themes"

By ALFRED W. STEWART. 419 pp. Longmans, Green & Co., Toronto. Price $7.00.

Professor Stewart will be remembered by many students of chemistry by his former works reviewing advances in the fields of organic and physical chemistry. He commands a literary style and the faculty of sound judgment and comparison. His works are of exceptional value to advanced students and all those who do not follow last month's journals in more than their own subject. What he has to say is always suggestive and designed to encourage individual thought.

In this work he deals with a number of themes of major chemical importance, and introduces them in an order that is somewhat original. The development of our conceptions of chemical reactions and the nature of matter in elemental, compound and colloidal form is exceedingly well done.

Facts and experimental data are fully presented where touched upon, and a good straight line divides experimental work and theory. Some twenty major chemical conceptions or subjects are developed and related to make a very pleasing, instructive and concise statement of progress to date.

This book should be well received and widely read.

FUTULIN

Futulin is a new material which may be used to great advantage in the preservation of iron. It is said to be vastly superior to ordinary paint in that it can be put on like paint, but is elastic, and therefore a change of temperature does not set up any action. With approximately 125,000,000 tons of ore being turned into iron yearly, a loss by corrosion of 5 per cent. is extremely serious, and to stop this action which is going on from year to year is of great importance. If futulin meets this demand, it will mean world-wide service to the iron industry. Saving the surface of metals is becoming more important.

TO INVESTIGATE ADOPTION OF CANADIAN BITUMINOUS COAL FOR DOMESTIC FURNACES

With the object of investigating the feasibility of adapting Canadian soft coal to furnace use, Hon. Charles Stewart, Minister of the Interior, is organizing a committee of coal and mining experts under the chairmanship of Dr. Charles Camsell, Deputy Minister of Mines. In addition to other duties, the committee will also give considerable attention to educating the public with regard to the best means of using coal.

INTERNATIONAL NICKEL RESUMES OPERATIONS AT CANADIAN MINES

The International Nickel Company has resumed mining and smelting operations at Copper Cliff and Creighton, Ont., after having been closed down since the spring of 1921. Although operations are only at one-third capacity of war-time capacity, it is confidently expected that the industry will steadily expand and will, within a few years, assume proportions that will tax the mining and smelting capacity of the company. In a recent interview, Mr. J. L. Agnew, general superintendent, stated that employment was being provided now for about 650 men, working in three shifts. The most important part of the announcement from a metallurgical standpoint is that hereafter the entire output of the Canadian smelters will be refined exclusively at the Port Colborne, Ont. refinery, and as the output increases the refinery will be considerably extended. The large refinery operated for years by the International at Bayonne, New Jersey, has been scrapped, and the equipment moved to Port Colborne.

After refining at Port Colborne, the refined nickel will be shipped to the new rolling mill at Huntington, Virginia, where there is the advantage of plenty of natural gas for heating purposes.

A large proportion of nickel, stated Mr. Agnew, would be used in the automotive industries, with the market largely in the United States, but as soon as European conditions adjust themselves the export market will rapidly expand. No change has been made in the new tariff affecting nickel.

INDUSTRIAL USE OF LIQUID METHANE

A process for the liquefying of methane, the principal constituent of natural gas, is being tried out in Germany, whereby the gas can be used in its pure form. For welding purposes it has many advantages over other gases commonly used. The oxy-methane flame is admirably suited for welding copper, brass and aluminium the oxygen flame of the gas being milder and softer than that of any other welding gas. Methane is also being used on a steadily increasing scale for the autogeneous cutting of iron. The liquefied methane is kept in ordinary steel cylinders under a pressure of 150 atm., and it is fed from these cylinders to the oxy-methane torch through the usual reduction valves. The new process is becoming quite popular in the welding industry of Germany.

RESEARCH ON LIQUID CARBON DIOXIDE

The Liquid Carbonic Division of the Compressed Gas Manufacturers' Association announces the establishment of an Industrial Fellowship in the Mellon Institute of Industrial Research of the University of Pittsburgh, for the purpose of classifying, studying and developing the uses for liquid carbon dioxide. The founding of this Fellowship is in accord with the desire of the members of the Association to co-operate with users and prospective users of liquid carbon dioxide, with the object of developing efficient means of applying the gas and of obtaining fundamental data bearing on its use in various industries.

In addition to conducting research work, the Fellowship will be made a clearing-house of information regarding various uses of liquid carbon dioxide, and data will be kept on file for the accommodation of prospective users of this product.

The present incumbent of the Industrial Fellowship is Charles L. Jones, who will be glad to correspond with anyone interested in the use of liquid carbon dioxide in industry.

CAMPHOR OIL PRESERVATIVE

Recent investigations have been made in Japan on various preservatives used in treating wood. It was found that a concoction made with the aid of teak wood was quite effective in destroying insects and fungi growth and other influences which shortened the life of wood. Camphor oil, however, was discovered to be even more effective, and its use has been introduced in Japan with considerable success.

INDUSTRIAL DEVELOPMENTS

Toronto, Ont.—Wabigoon Soapstone Company, Limited, have been incorporated under the Ontario Companies Act with capital of $500,000 for the purpose of developing the deposit of soapstone located at one mile west of Wabigoon station, near Dryden, Ont. At present equipment is being installed and actual operations are expected to begin about April 1st. The officers of the company are H. H. Sutherland, Toronto, president; E. Pidgeon, Wabigoon, Ont., vice-president; R. E. Evans, Toronto, secretary-treasurer. The company's property at Wabigoon consists of 90 acres, and a report covering his investigation of the deposit by Hugh E. Spence, M.E. of the Mines Branch, Department of Mines, Ottawa, appeared in CANADIAN CHEMISTRY AND METALLURGY, September, 1922, p. 205. Soapstone is used for many and varied commercial purposes, such as the lining of the reclaiming furnaces in Kraft pulp mills, while ground soapstone is also used as a filler in the making of rubber products.

Toronto, Ont.—Ault & Wiborg Company of Canada, Limited, printing ink and color makers, are preparing plans for the erection of an eight-storey building, 25 x 55 feet, adjoining their present plant on Charlotte Street. Their present plant will also be enlarged by adding four more storeys.

Hamilton, Ont.—The Cooperage Company of Canada, Ltd., have opened two new plants in the Maritime Provinces, one at St. John, N.B., and the other at Sydney, N.S.

New Westminster, B.C.—The Triangle Chemical Co., fertilizer manufacturers, intend establishing an additional plant for the manuf acture of iron oxide.

Brantford, Ont.—Plant expansion to take care of increasing business is contemplated by the Brantford Brass Foundry, Limited, manufacturers of brass, bronze and aluminum castings.

G. F. Sterne & Sons, Limited, have completed and are now occupying their new plant for the manufacture of special cements. Their old plant has been remodelled for the manufacture of chemical products.

New Westminster, B.C.—Pacific Starch Products expect to shortly commence the manufacture of potato starch.

Medicine Hat, Alta.—The Medalta Stoneware, Limited, recently increased its capital to $500,000 and incorporated as Medalta Potteries, Limited. In addition to their former products such as mixing bowls, crocks, etc., they will now take on the manufacture of white porcelain ware.

CANADA AS A BUYER OF AMERICAN MACHINERY

American Commerce Reports list Canada as the second largest foreign buyer of American Machinery. In 1910 we bought more than twice as much as any other country, and easily stood first at $14,129,298. In 1921 Mexico is ahead with $30,784,076 and Canada next with $28,474,868. It is no great wonder that American manufacturers are interested in holding open foreign markets. Unfortunately, this involves buying abroad, which is not the policy of the present makers of the American tariff.

PAPER INDUSTRIES EXHIBITION, NEW YORK, APRIL 9TH TO 14TH

In the Paper Industries Exposition, to be held during the week, April 9th to 14th, at Grand Central Palace, New York, while the American Paper and Pulp Association and its related associations are meeting, three main groups will feature the list of exhibits at the Paper Industries Exposition, as part of the general program which provides for the telling of the whole story of paper from the forest to the ultimate consumer.

Exhibits will be arranged in a general way according to the three chief steps in the progress of manufacture and distribution, the first being the paper making machinery and the chemicals entering into the manufacture of paper. The second will be the making of paper itself, and the third the conversion of paper into its various subdivisions in which it reaches the public, such as boxes, twine, and specialties, as well as the large field of distribution to printer and consumer in the form of writing paper and other papers.

COSMOS CHEMICAL COMPANY MAKING PROGRESS

During the past year, the Cosmos Chemical Co., of Port Hope, have increased their capacity for the production of lacquers and various types of finishes. They have installed a new ball-mill and increased their distillation capacity. Their business has expanded, particularly in the furniture field, and they have under development some new quick-drying finishes. They have taken the agency for the Matchless Metal Polish Co., of Chicago. Their manufacturing operations are under the strictest chemical control, and they report good progress in the development of a demand for well-made Canadian goods in these lines.

COMPANY NEWS

Typke-King, Limited.—This well known British company, established in 1883, has steadily developed from small beginnings until today its plant at Mitcham Common, Surrey, England, covers more than eleven acres. The company specializes in chemicals for the rubber industry, and its products including golden and crimson antimony sulphides are being exclusively handled in Canada by E. A. Schofield & Co., St. Nicholas Bldg., Montreal, and Bank of Hamilton Bldg., Toronto.

Chemical Products, Ltd.—For the year ending June 30th, 1922, the Chemical Products, Ltd., of Trenton, Ont., reports total sales at $36,023, with the cost of sales $34,213, leaving a gross profit of $1,810.

Sundry revenues of $1,727 brings up the total profit to $3,537. After deduction of selling and distributing expenses, amounting to $6,340, the result is a net trading loss of $2,802, to which must be added depreciation in inventory values, $54,744; expenses not absorbed, $36,527; bad debts $225, or a total of $91,497. Added to the trading loss, the net loss for the year stands at $94,299.

In the auditors' reports it is stated that the inventory has been taken at the market value, the depreciation amounting to $54,745. During the year under review the buildings, plant and equipment account has been increased by $119,757, such increase largely consisting of the cost of completing the acid phosphate building. The real estate account has been reduced by $23,540, which represents the value of vacant land sold.

The mortgage on the company's property, which is payable by the Ontario and Quebec Finance Corporation, Ltd., became due on Jan. 1st, 1922. At the date of closing, the amount owing under mortgage, including interest, was $227,243.

Ames-Holden Tire Company.—The Ames-Holden Tire and Rubber Company have recently entered into a working agreement with the B. F. Goodrich Co. of Akron, Ohio., whereby these companies will be closely associated in Canadian business. This agreement is looked on favorably in business circles as justifying the confidence which, even through the most trying period of its career has been generally existant as to the merit of the AmesHolden Company.

Standard Chemical Company.—The year ending March 31st, 1922, was marked by severe depression in the chemical industry, particularly in the wood distillation end of it, so that there is good cause for a deficit of $624,088 covering the period mentioned by the Standard Chemical Company, as compared with a surplus of $138,280 for the previous year covering 15 months. Actual profits on operations for the year ending last March 31st amounted to only $20,621, as compared with $340,328 for the 15 months covered by the previous statement. During the past three months, however, a decided change for the better has occurred, and the products of the company are in good and increasing demand. The executive of the company are to be congratulated on having so ably guided the company's affairs through such a trying period.

A NEW VALVELESS PUMP

A pump of a rather interesting type and of special use when handling semi-solid fluids, is being built in Canada. This Magna Pump, as produced by a Hamilton company, has no suctoin valves, the suction connection being on the top of the water cylinder, and the opening into the cylinder being nothing but a round hole. The plunger is of the solid pattern, and passes backwards and forwards under this hole. From the time of starting from one end of the cylinder until it gets past the suction opening, there is not much discharge, as a portion of the substance being pumped can pass back through the suction pipe. After the plunger passes this opening, there is no other outlet, except through the discharge valves. During this movement, a vacuum is being created at the other side of the plunger, and, as soon as the plunger passes the suction opening, this vacuum is filled from the suction pipe. The net result of the stroke is about half the displacement of the plunger.

These pumps are said to be specially suitable for handling semi-solid fluids in sugar-houses, semi-cold lard, soap, white lead, printers' ink, tar and materials of similar consistency.

POWER DEVELOPMENTS IN QUEBEC

Operations on the harnessing of power from Lake St. John and the Saguenay River, Quebec, are announced by a company of United States and Canadian financiers, capitalized at $25,000,000. At the head is James B. Duke, with Sir William Price, of Price Bros. & Co., Ltd., print paper manufacturers, as vice-president.

W. S. Lee, H. L. Brown and J. M. McCarthy, are vice-presidents; W. C. Parker is secretary treasurer, and G. G. Allen and W. R. Perkins are directors.

Two developments will furnish 1,200,000 horsepower, 200,000 of which will be used by Price Bros., enabling them to add new mills, which will make them the largest producers of newsprint in the world.

The power plant will consist of 12 units, developing 35,000 horse-power. W. S. Lee, a well known electrical and hydraulic engineer, is in charge of the engineering operations. The sinking of coffer dams for the plant is already under way.

The preliminary steps necessary to raise the level of the lake to the 20 foot height in order to assure a continuous flow to the turbines beneath a great thickness of ice, has commenced.

The enterprise has received the support of L. A. Taschereau, Prime Minister of Quebec, who has seen great opportunities for the development of the resources of his Province.

CATALOGS RECEIVED

The Irreducible Volume—This is the title of a forty page booklet, published by The Vitrefax Company, 51st to 52nd S. Pacific Block, Los Angeles, Cal., descriptive of their super refractories. More failures of firebrick are traceable to premature softening or shrinking of the brick body, resulting in collapse of arches and walls than can be laid to the actual melting of the brick. Loss in volume is responsible for the failure. Refractories manufactured under the Vitrefax process are reduced, through intense heat to its condition of ultimate stability. They embrace melting point temperatures from 3200° F. to 5072° F. The booklet describes the success attained with the making of synthetic refractories, and this section would be worth reading by any chemist or engineer. The illustrations are exceptionally good.

BULLETINS

Cooper Hewitt Electric Company—Ultra Violet Light has many new and interesting applications. It is no longer confined to the experi-

mental laboratory, but is being used for industrial applications on a large scale. Four Bulletins issued by the Cooper Hewitt Electric Co., Hoboken, New Jersey, illustrate these uses very well. The Viviarc, made of fused Brazil rock crystal, is the most efficient source of high frequency ultra violet radiation, and has a number of laboratory uses. The Viviarc Test Cabinet is used for testing dyes, inks, textiles, paints, paper, and leather. The Labarc is a high intensity quartz mercury arc for polarimetry, spectrometry, photomicrography, filter absorptions, etc.

CUSTOMS REGULATIONS

At a meeting of the Board of Customs, held in Ottawa on the 1st November, 1922, the following declaration was made:—

Declared that Silica Firebrick composed of not less than 90% of silica, Magnesia Firebrick and Chrome Firebrick, are of a class or kind not made in Canada and are entitled to entry free of Customs duty under tariff item 281. All other Firebrick are held to be of a class or kind made in Canada and subject to duty under tariff item 282. This ruling not to apply to firebrick bona fide ordered prior to 1st November 1922, and entered for consumption, prior to 1st January, 1923.

Mineral Industry of British Empire (War Period)—Part III., Coal, Coke and By-Products—A complete summary of the situation during the war. Part III. dealing with European, African and Asia foreign countries, also with countries in North and South America outside of British possessions. Copies may be obtained from H. M. Stationery Office, Princes St., Westminster, S.W.1, London, Eng. Price 7s. 3d.

Dr. Knowles, a Russian chemist, is seeking concessions from the Provincial Government in connection with the establishment of an experimental plant on the Songhees Indian reserve, near Victoria, for the purpose of demonstrating a process that he claims to have invented for the recovery of copper from its ores.

Record Production at Consumers' Gas Co.

Gross earnings of the Consumers' Gas Company, Toronto, amounted to $6,813,939, and net $1,478,274 for the year ending September 30th, 1922, a slight decrease as compared with the previous year's report. The shortage of coal made a great demand on gas. September's demand of 15,527,000 cubic feet being the greatest of any month in the company's history.

The highest production for one day was 18,662,000 cubic feet, produced on September 25th. 132,141 meters were in use at the end of the fiscal year.

Total assets of the company amounted to $13,374,029.

NEW ASBESTOS PLANT

Asbestos Corporation of Canada will erect one of the most modern and up-to-date plants in existence at a cost of $500,000. With the erection of this Montreal mill, it is expected that the cost of production will be considerably reduced. There will be no need of further financing, as the cash resources now amount to $2,500,000.

CORMAN ENGINEERING COMPANY EXPANSION

The Corman Engineering Company, Toronto, have recently taken over the Chapman Ball Bearing Company, and have moved their operations to the Sorauren Ave. plant.

CANADIAN TRADE

For the year ending September, 1922, the United States leads the United Kingdom by $11,000,000 in Canadian trade. Canadian exports to the United Kingdom increased $26,000,000, while exports to the United States decreased 97,000,000 for the year.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa

NOTE.—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

The Cyanide Process of Treating Ores.—D. L. H. Forbes, 226,961, Dec. 12, 1922. In the treatment of refractory ores of precious metals by the cyanide process small quantities of dry Na_2O_2 are injected below the surface of a mixture of the fine ore and cyanide solution.

Method of Converting Zinc Powder into Fluid Zinc.—E. S. Berglund, 226,929, Dec. 12, 1922. Zinc powder is subjected to centrifugal action, and a stirring operation to separate the metal drops therefrom. Apparatus is also specified.

Wrought Iron.—E. E. Elliott, 226,745, Dec. 5, 1922. A charge of cast Fe, iron ore, purple ore and top-cinder is heated in a special Fe receptacle, which may be withdrawn from the furnace and hammered and worked in any desired way.

Aldehyde Ammonia.—F. W. Skirrow and G. O. Morrison, 223,598, Sept. 12, 1922. Aldehyde and NH_3 are brought together in a water vehicle and the aldehyde NH_3 formed dissolves in water until saturation, when it crystallizes out and may be separated by filtration and the saturated solution is returned to the reaction.

Manufacture of Dispersoids, Colloid Powder.—H. Plauson, 226,634, Nov. 25, 1922. Dispersoids are prepared by intensively mechanically disintegrating a soluble colloidgel in a non-solvent to yield a colloidal solution of the soluble type. A dispersion accelerator or an emulsifying agent, such as soap, may be added.

Method of Making Methylsalicylic Menthyl Ester.—G. Blieberger, 226,478, Nov. 21, 1922.

Waterproofing Cement.—C. W. Ball and F. L. Pilgrim, 226,350, Nov. 21, 1922. Cement is made water proof and strengthened by the addition of diatomaceous earth.

Complex Arseno-Stibino Compounds.—C. N. Myers, 226,329, Nov. 21, 1922.

Drying Sulfite Waste Liquor.—C. Ellis, 226,306, Nov. 21, 1922. A current of gas containing some free O but less than does ordinary air, is circulated, and finely divided liquid to be dried is sprayed into the gas current in its circuit. The moisture is removed from the circulating gases at another portion of its circuit.

Catalyzer for Oil Hardening.—C. Ellis, 226,305, Nov. 21, 1922. A catalyzer suitable for the hydrogenation of fatty oils is made by incorporating a basic compound of a metal of the Ni group with a waxy vehicle, heating the mixture above 300°, whereby cracking of the wax and reduction of the metal compound occur and agitating the mixture during the process.

Obtaining Nitric Acid by the Electric Arc.—Dr. W. Siebert, 226,263, Nov. 21, 1922. In obtaining HNO_3 by means of the electric arc in a closed cycle, a temperature below .10° is maintained in the last portions of the absorption installation, so that the content of steam in the O and N gases led back to the furnace is reduced to a practically irrelevant amount.

Ammonia Synthesis and Catalyst.—J. C. Clancy, 226,262. Nov. 21, 1922.

Process of Treating Copper Nickel Matte.—G. Haglund.

Smelting Tin and Other Ores.—Jas H. Gray, 226,050. Nov. 14, 1922.

Sterilization and Purification of Water.—J. N. A. Sauer, 226,045, Nov. 14, 1922, Sept. 28, 1922. Water is sterilized and simultaneously purified by treating it with finely divided decolorizing C (active C of vegetable origin) containing a very small content of mineral substance and which C has preferably been subjected to a high temperature.

Titanium Oxide Pigment.—W. F. Washburn, 225,981, Nov. 14, 1922. A pigment containing crystalline TiO_2 and combined P is prepared by mixing a compound comprising essentially TiO_2 with a compound of P and calcining the mixture at a temperature below its m.p.

Process for Making Contact Sulphuric Acid.—H. F. Merriam, 225,951, Nov. 14, 1922. In the contact process of making H_2SO_4, S in the form of brimstone of the Louisiana brimstone type is burned to produce SO and O, which are conducted over calaytic material to give a 97-98% conversion, the SO_3 formed is absorbed and the whole operation is conducted without permitting the temperature to fall materially below that required for the production of SO_3 in the converters.

SYNTHETIC Ammonia.—L. Casale, 225,824, Nov. 14, 1922. A mixture of H and N under high pressure is passed over a catalyst along with sufficient NH_3 to regulate the thermic effect of the reaction.

Chemicals

The beginning of February finds the Canadian Chemical Market showing a slight gain over New Year conditions. There has not been the rapid increase to business that some expected. Take it on the whole, January was a rather quiet month, but nevertheless, dealers report a slight gain in orders. That the present industrial crisis in Germany has no doubt stimulated orders from domestic and American houses, yet, as yet, there has been no real marked decrease in German importations, though such decrease will naturally take place, should the German situation become worse.

The heavy chemical market continues firm, and February quotations are practically unchanged from January offerings. The sale of liquid chlorine to the pulp and paper and textile mills has eaten into the bleaching powder sales, though business in bleach is still active enough to keep the price firm, and no reduction is noted at either Montreal or Toronto. There is a good demand for caustic soda, and of late the flake grade as opposed to the ground is coming into preference. The flake is selling at the same quotations as is the ground $5.00–$5.50 per cwt. The only reduction in the heavy chemicals has been hydrochloric acid, which has declined 3 cents per lb. There is a good trade going in hydrochloric, 60%, at 22 cents to 25 cents per lb. and 11 cents to 13 cents for the 30%.

Ammonia aqua, 26, carboys is in good demand also at 13 to 14 cents per lb. It was rumored that there was some German ammonia being offered at Toronto at 12 cents, but at the time of going to press (February 5th) no dealer could be found openly quoting that price.

Acetic acid, acetone, and wood alcohol, continue in good demand with prices steady. The export trade in Canadian calcium carbide is experiencing a decided revival, and it is most encouraging to note that Canadian carbide can more than hold its own with other makes.

Pharmaceuticals.—The pharmaceutical market is quite active again after a somewhat dull period, prevailing epidemics are largely responsible for this renewed activity. Aspirin at 75 cents to 80 cents per lb. in 100 lb. lots, (bulk) is in keen demand.

Gums, Waxes.—There is a noticeable gain in sales of varnish gums, shellacs, and waxes. The paint and varnish factories are increasingly busy, as are also the floor wax and filler works.

Metals

Advances have again occurred in lead and zinc quotations. Lead is stronger by 35 cents per cwt. than at January 1st, and a good business with the wire cable and dry battery makers is expected for this spring, making any reductions in lead prices extremely unlikely. The zinc market also remains firm. Copper is slightly stronger, and it would appear, that after a very long depression, that the copper market has at last been established on a sound basis. An advance of 15 cents per cwt. for electrolytic copper is noted since January 1st.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals and Industrial Minerals.

Inorganic.

Alum, Ammonia, lump or ground	100 Lbs.	4.50— 5.00
Ammonium Bromide	Lb.	.. — .22
Aluminum Sulphate, lump, bags	Cwt.	2.25— 2.50
Aluminum Sulphate, ground, bags	Cwt.	2.50— 2.75
Aluminium Sulphate, iron free	Cwt.	.. — 4.00
Ammonia, Aqua, 26, Carboys	Lb.	.13— .14
Ammonia, Aqua, 26, Drums	Lb.	.. —.09½
Ammonium Carbonate	Lb.	.12— .15
Ammonium Chloride	Lb.	.08— .11
Ammonia Iodide	Lb.	.. — 6.25
Arsenic	Lb	.10— .12
Barium Sulphate (Barytes)	Per Ton	30.00—35.00
Barium Chloride	Lb.	.05— .07
Barium Nitrate	Lb.	.. — .16
Barium Peroxide	Lb	.. — .21
Barium Sulphate, B.P.	Per Ton	60.00—60.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	Lb.	2.50— 3.00
Borax, crystals	Lb.	.07—.07¼
Boric Acid	Lb.	.. — .13
Bromine (technical)	Lb.	.. — .38
Calcium Acid Phosphate	Lb.	.. —.07½
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —95.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —100.00
Calcium Chloride, fused	Per Ton	.. —25.00
Calcium Chloride, flake	Ton	40.00—42.00
Caustic Soda, flake, drums	Cwt.	5.00— 5.50
Caustic Soda, ground, drum	Cwt.	5.00— 5.50
Caustic Soda, solid, drum	Cwt.	4.25— 4.75
Camphor Monobromate	Lb	.. — 3.00
Carbon Bisulphide, in drums	Lb.	.11— .12
Carbon Tetrachloride, drums	Lb.	.. — .15
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, Canadian, f.o.b. Huberdeau, Que., car lots	Ton	17.00—18.00
China Clay, imported	Per Ton	20.00—25.00
Cobalt Oxide, black	Lb.	.. — 2.00
Cobalt Oxide, grey	Lb	.. — 2.25
Copperas (Iron Sulphate) crystals	Lb.	.02—.02¼
Copperas (Iron Sulphate) sugar	Lb.	.02—.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.08—.08¼
Corrosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.10
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	.. —30.00
Ferric Chloride, crystals	Lb.	.11— .12
Ferric Chloride, solution	Lb.	.. — .10
Hydrofluoric Acid, 60%	Lb.	.22— .25
Hydrofluoric Acid. 30%	Lb.	.11— .13
Hydrochloric Acid, carboys, 18	100 Lbs.	2.25— 2.75
Hydrogen Peroxide	Gal.	.70— .75
Iodine, crude	Lb.	.. — 4.50
Iodine, resublimed	Lb.	.. — 5.25
Iron Oxide (red)	Lb	.05— .13
Lead Acetate	Lb.	.14— .16
Lead Nitrate	Lb.	.14 — .15
Lime, grey	Ton	.. —14.30
Lime, grey, in car lots	Ton	.. —11.70
Lime (hydrated) in ton lots	Ton	.. —20.00
Litharge	Lb.	.09— .10
Lithium Carbonate	Lb.	1.75— 2.10
Lithopone	Lb.	.. —.07½
Magnesite, calcined	Per Ton	.. —30.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.12— .13
Magnesium Sulphate	Lb.	.03½—.04½
Mag. Sulphate, B.P., Medicinal	Single Ton	60.00—70.00
Mag. Sulphate, Technical, car lots	Ton	45.00—50.00
Mica, ground, f.o.b. Hull, Que.	Ton	.. —60.00
Muriatic Acid, 18	100 Lbs.	2.25— 2.75
Nickel Salt, single, in bbl. lots	Lb.	.. —.13¼
Nickel Salt, single, per cwt.	Lb.	.. — .15
Nickel Salt, double, barrel lots	Lb	.. — .14
Nickel Salt, double, per cwt.	Lb.	.. —.15½
Nitric Acid, 36 carboys	100 Lbs.	8.75— 9.00
Phosphoric Acid, 85%	Lb.	.. — .28
Phosphoric Acid, 50%	Lb.	.. — .22
Phosphorus, yellow	Lb.	.. — .34
Potash Prussiate, yellow	Lb.	.28— .30
Potassium Bicarbonate	Lb.	.. — .20
Potassium Bromide, crystals	Lb.	.22— .30
Potassium Bromide, granular	Lb.	.22— .30
Potassium Bichromate	Lb.	.17— .18
Potassium Carbonate, calc. 80%-85%	Lb.	.. — .09
Potassium Chlorate	Lb.	.. — .10
Potassium Citrate	Lb.	.90— 1.00
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .45
Potassium Hydroxide (caustic potash) small drums.	Lb.	.10— .15
Potassium Hydroxide (caustic potash) large drums.	Lb.	.07— .08
Potassium Iodide	Lb	.. — 4.40
Potassium Nitrate, casks	Lb.	.10— .12
Potassium Permanganate, bulk	Lb.	.19— .20
Red Precipitate (Mercuric Oxide)	Lb.	.. — 1.50
Silver Nitrate	Lb.	.. — 9.00
Soda Ash, bags	Cwt.	2.25— 2.40
Sodium Acetate, ton lots or over	Lb.	.. — .08
Sodium Acetate, lesser amounts	Lb.	.. —.08½
Sodium Aluminium Phosphate	Lb.	.. —.03½
Sodium Benzoate	Lb.	.75— .80
Sodium Bicarbonate, 100% pure	Lb.	2.50— 3.00
Sodium Bichromate, bbls.	Lb.	.10— .13
Sodium Bisulphite, powder	Lb.	.05¼— .06
Sodium Bisulphite, 35 Be	Lb.	.03—.03¼
Sodium Bromide (foreign)	Lb.	.. — .24
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. — .31
Sodium Fluoride, 95-98%	Lb.	.15— .16
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.00
Sodium Hyposulphite, barrels	Cwt.	4.00— 4.50
Sodium Iodide	Lb.	.. — 4.90
Sodinm Nitrate, refined	Cwt.	6.75— 7.00
Sodium Nitrate, crude, 95%	Cwt.	5.25— 5.75
Sodium Nitrite	Lb	.12— .15
Sodium Perborate, U.S.P.	Lb.	.35— .40
Sodium Peroxide, f.o.b. New York	Lb.	.30— .35
Sodium Silicate, 42°, car lots	Cwt.	.. — 1.35
Sodium Silicate, 42°, smaller lots	Cwt.	.. — 1.55
Sodium Silicate, 40°, car lots	Cwt.	.. — 1.25
Sodium Silicate, 40°, smaller lots	Cwt.	.. — 1.45
Sodium Sulphide, 60-62% fused	Lb.	.08— .09
Sodium Sulphate (Glauber's Salts) crystals,	Per Cwt. in Bags	1.80— 2.00
	Per Cwt. in Car Lots	1.65— 1.70
Sodium Sulphite	Lb.	.. — .05
Sodium Prussiate, Yellow	Lb	.24— .25
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.25— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.25— 2.75
Sulphuric Acid, 66 Be, tank cars, f.o.b. Toronto, Ton		23.75—24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —23.00
Tin Chloride crystals	Lb.	.30— .35
Tri-sodium Phosphate	Lb.	.07—.07½
Ultramarine, Blue	Lb.	.10— .29
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 1.60
Whiting (English)	Ton	.. —30.00
Whiting (American)	Ton	.. —30.00
Zinc Sulphate, com.	Lb.	.04—.04½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.09— .10
Zinc Stearerate	Lb.	.25— .30

Organic.

Acetanilid, C. P.	Lb.	.45— .50
Acetic Acid, glacial, barrels, f.o.b. Shawinigan Falls.	Lb.	.. — .12
Acetic Acid, glacial, carboys, f.o.b. Shawinigan Falls,	Lb.	.. —.12½
Acetic Acid, glacial, bbls., car lots, fo.b. Shawinigan,	Lb.	.. — .16
Acetic Acid, 28%, carload lots	100 Lb.	.. — 4.80
Acetic Acid, 28%, 25 bbl. lots	100 Lb	.. — 5.05
Acetic Acid, 28%, 10 bbl. lots	100 Lb.	.. — 5.30
Acetic Acid, 28%, 5 bbl. lots	100 Lb.	.. — 5.55
Acetic Acid, 28%, 1 or 2 bbl. lots	100 Lb.	.. — 5.80
Acetic Acid, 80%, carload lots	100 Lb.	.. —13.20
Acetic Acid, 80%, 25 bbl. lots	100 Lb.	.. —15.20
Acetic Acid, 80%, 15 bbl. lots	100 Lb.	.. —16.20
Acetic Acid, 80%, 10 bbl. lots	100 Lb.	.. —16.75
Acetic Acid, 80%, 5 bbl. lots	100 Lb.	.. —17.20
Acetic Acid, 80%, 3 or 4 bbl. lots	100 Lb.	.. —18.20
Acetic Acid, 80%, 1 or 2 bbl. lots	100 Lb.	.. —18.50
Acetone, pure, drums or over	Lb.	.. — .27
Acetone, pure, lesser amounts	Lb.	.. — .34
Aspirin, in 100-lb. lots, bulk	Lb.	.75— .80
Alcohol, Absolute Ethyl, case of 1 doz.	1-lb. bottle	.. — 3.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —23.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.15
Alcohol, acetone, lesser amounts	Gal.	.. — 1.45
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.20
Alcohol, wood, 97%, half bbl. lots	Gal.	.. — 1.35
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 1.50
Aldehyde Ammonia	Lb.	.. — .75
Amyl acetate, technical	Gal.	4.50— 5.00
Amyl Acetate, pure	Lb.	.. — .80
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.85 — .90
Caffeine, English	Lb.	.. — 3.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.25
Camphor, refined, slabs	Lb.	.. — 1.25
Camphor, refined, tal.	Lb.	.. — .98
Carbolic Acid, white crystals	Lb.	.25— .30
Chloroform	Lb.	.40— .50
Citric Acid, domestic, crystals	Lb.	.50— .60
Coumarin	Lb.	3.00— 3.50
Cream Tartar, 98%	Lb.	.25— .30
Dextrine, potato	Lb.	.. — .06
Dextrine, corn	Lb.	.. —.08½
Ether, B.P. (conc.)	Lb.	.. — .55
Ether, Sulphuric	Lb.	.28— .38
Formaldehyde, bbls. or over	Lb.	.. —.19½
Formaldehyde, 200-lb. kegs	Lb	.. —.24½
Formaldehyde, 100-lb. kegs	Lb.	.. —.25½
Formaldehyde, 50-lb. kegs	Lb.	.. —.26½
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	.. — 6.00
Gallic Acid	Lb.	1.25— 1.75
Glycerine, crude, single tin of 56 lbs.	Lb.	.. — .17
Glycerine, crude, two or more tins	Lb.	.. — .15
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .29
Glycerine, C.P., two or more tins	Lb.	.. — .27
Glycerine, (pale straw), single tin 56 lbs.	Lb.	.. — .28
Glycertine, (pale straw), two or more tins	Lb.	.. — .26

Glycerine, C.P. drums, 500-1,000 lbs.	Lb.	.. — .21
Glycerine, pale straw, drums, 500-1,000 lbs.	Lb.	.. — .20
Hexametbylenetetramine		.. — .90
Oxalic Acid	Lb.	.18— .20
Oleic Acid	Lb.	.. — .18
Phenacetin	Lb.	2.00— 2.25
Pbenolphtbalein	Lb.	.. — 1.50
Pyrogallic Acid	Lb.	2.00— 2.10
Quinine	Oz.	.55— .60
Saccharin	Lb.	2.25— 2.75
Salicylic Acid	Lb.	.. — .50
Starch, corn, ground, car lots	Lb.	.. —.04¼
Starch, potato, ground, car lots	Lb.	.. —.08½
Stearic Acid, Double Pressed	Lb.	.18— .19
Stearic Acid, Triple Pressed	Lb.	.19— .21
Tartaric Acid, crystals or powdered	Lb.	.. — .38
Tannic Acid, commercial	Lb.	.45— .65

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .22
Hydrochloric Acid, C.P.	Lb.	.. — .14
Nitric Acid, C.P.	Lb.	.. — .22
Sulphuric Acid, C.P.	Lb.	.. — .13

Industrial Gases.

Acetylene, cylinders	per 100 cu. ft.	2.55— 3.00
Coal Gas, cylinders	per 100 cu. ft.	3.00— 4.00
Hydrogen, cylinders	per 100 cu. ft.	1.50— 2.00
Nitrogen, cylinders	per 100 cu. ft.	2.00— 3.00
Oxygen, cylinders	per 100 cu. ft.	1.50— 2.00

Fertilizer Materials.

Acid Pbospbate	Ton	20.00—22.00
Animal Tankage, per unit of Ammonia		.. — 2.65
Animal Tankage, per unit of Bone Pbosphate of lime		.. — .10
Nitrate of Soda		.. —62.00
Muriate of Potash	Ton	.. —40.00
Pure Ground Blood, per unit of Ammonia		.. — 3.00
Steamed Bone Meal	Per Ton	25.00—30.00
Sulphate of Ammonia	Ton	.. —65.00

Tanning and Dyeing Material

Fustic Crystals	Lb.	.26— .30
Hematine Crystals	Lb.	.18— .22
Logwood, Solid	Lb.	.18— .22
Quercitron Liquid Extract	Lb.	.07— .08
Liquid Sumac Extract	Lb.	.08— .09
Ground Sumac	Ton	65.00—70.00
Chestnut Liquid Extract	Lb.	.02½—.03½
Hemlock Liquid Extract	Lb.	.03½— .04
Quebracbo Liquid Extract	Lb	.03—.03½
Quebracho Solid Extract	Lb.	.04¾—.05½

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Cottonseed Oil, crude, f.o.b. Texas points	Lb.	.. —.08½
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Gums—

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Tragacantb, No. 1, Flake	Lb.	.. — 1.50
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Arabic, regular grain No. 4 and No. 5	Lb.	.. — .26
Arabic, regular grain No. 2	Lb.	.. — .27
Arabic, white sorts	Lb.	.. — .30
Arabic, powdered, No. 1	Lb.	.. — .38
Arabic, powdered, No. 2	Lb.	.. — .37

Waxes—

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Paraffin, 118°—120°, M.P., 250 lb. lots	Lb.	.. — .05
Parowax, blocks, 100 lb. lots	Lb.	.. —.08¾

Carnauba.

No. 1	Lb.	.. — .47
No. 2	Lb.	.. — .38
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North Country, No. 3	Lb.	.. — .19

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No. 3	Lb.	.25— .30
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B. 2	Lb.	.30— .35
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Soluble A	Lb.	.16— .18
Soluble Chips	Lb.	.10— .12
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Genuine Chips	Lb.	.10— .12

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Copper, electrolytic, car lots	Cwt.	.. —16.85
Copper, casting, small lots	Cwt.	.. —16.35
Copper, casting, car lots	Cwt.	.. —15.85
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Lead, Pig, small lots	Cwt.	.. — 7.95
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Magnesium, ribbon	Lb.	.. —18.00
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Monel Metal, sbot	Lb.	.. — .34
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Platinum, 5% iridium	Oz.	..—128.00
Platinum, 10% iridium	Oz.	..—138.00
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Steel, sheet, 28 gauge, size 36"	Cwt.	.. — 5.35
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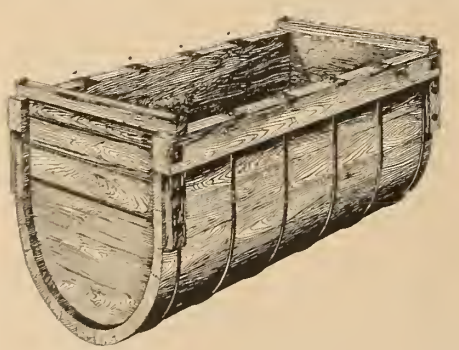

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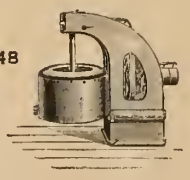

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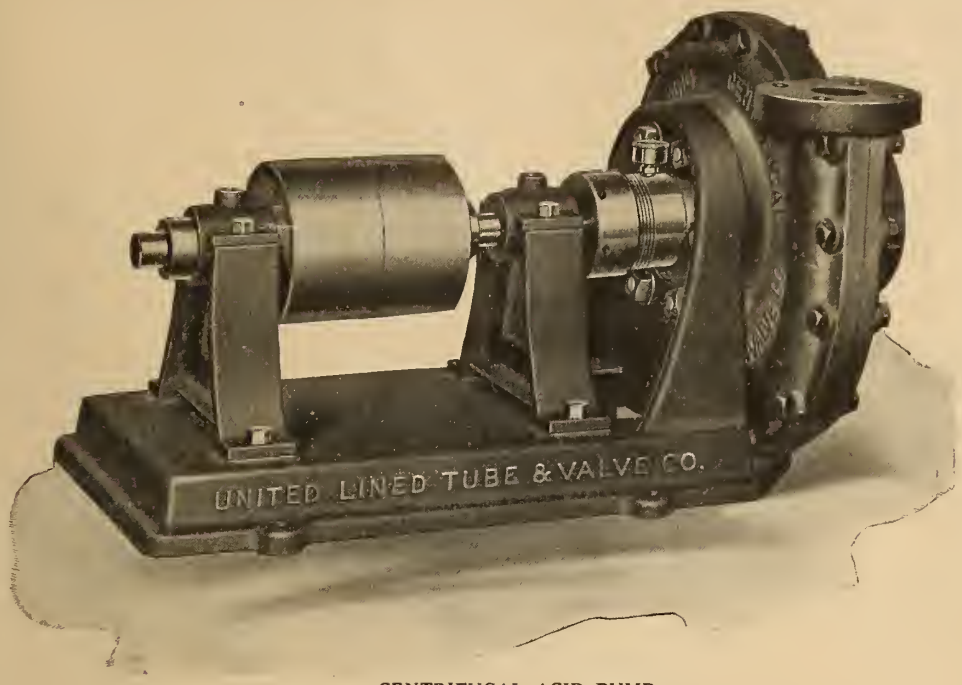

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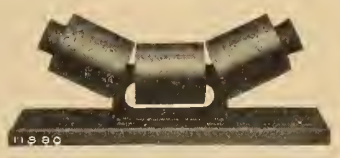

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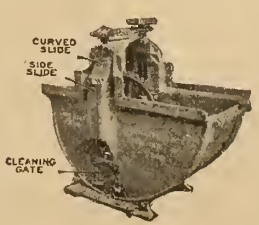

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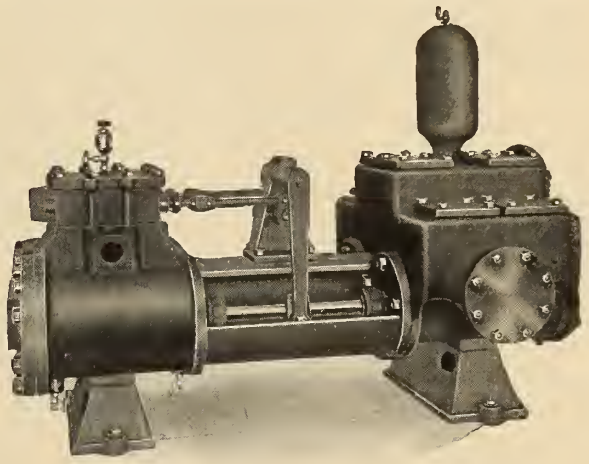

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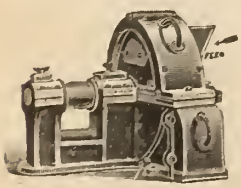

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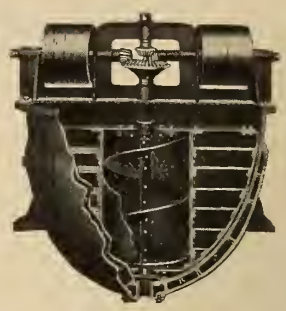

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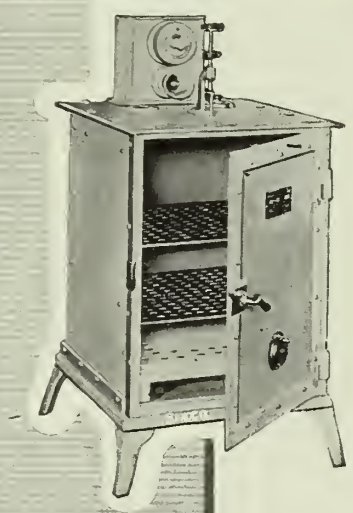

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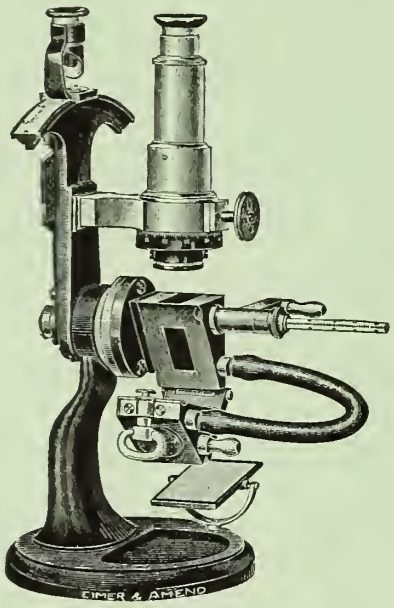

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This instrument excels other refractometers in accuracy. It is easy to operate. Results are accurate to within ±0.1 of a scale division. This value corresponds to from 3.5 to 4.0 units in the fifth decimal place for the D line.

The Immersion Refractometer is regularly used to determine the refractive indices of fluids such as alcoholic and weak acid solutions. The disadvantage of the instrument has been its narrow range. We now wish to announce the new UNIVERSAL IMMERSION REFRACTOMETER. This is similar to the regular Immersion Refractometer, except that it has an arrangement by means of which different prisms may be substituted. Thus the range of the instrument is greatly widened, making the range almost equal to that of the Abbe.

Universal Immersion Refractometer only, without prism	$124.00
Prism No. 1—1.325 to 1.367	28.00 each
2—1.366 to 1.396	
3—1.396 to 1.421	
4—1.419 to 1.449	33.00 each
5—1.445 to 1.472	
6—1.464 to 1.492	

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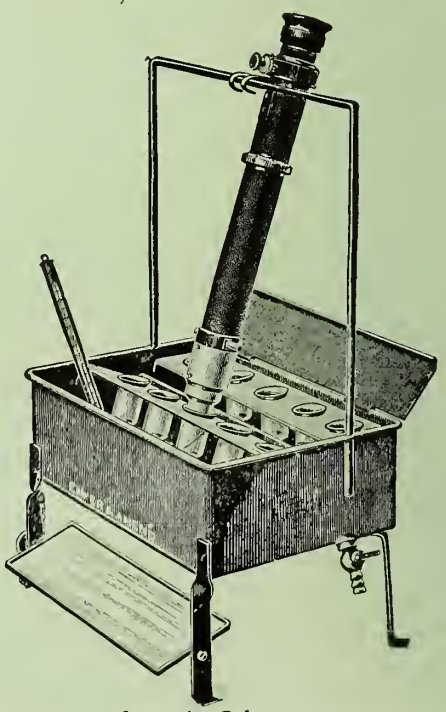
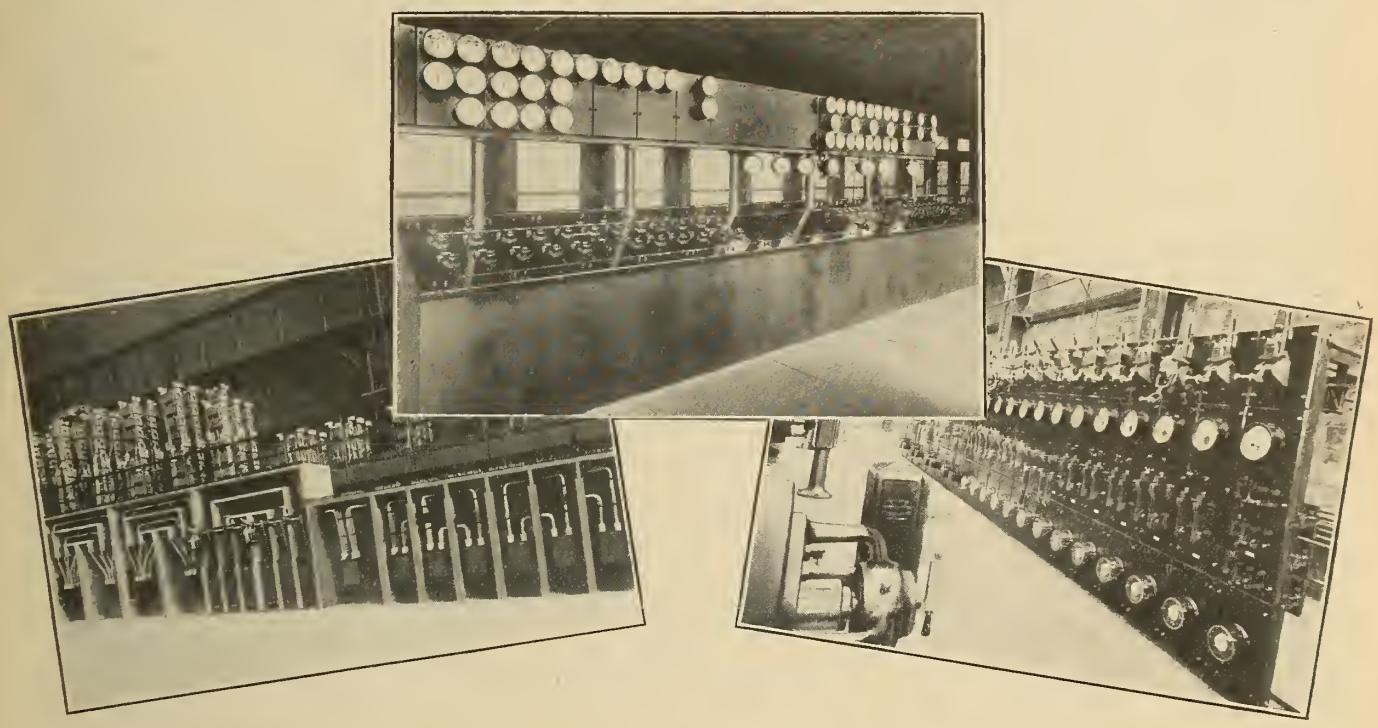

Immersion Refractometer

Switchboard Equipment



A Representative Steel-Mill Installation

The centre illustration shows the 18-section control desk located in the customers' No. 2 power house, and controls the following equipment.

Four 3500 kva., 6600-volt, 3-phase, 25-cycle Generators.
One 250-volt, 1500-ampere-hour storage battery.
Two 300 kw., 250-volt Compound-wound Exciters.
Two Induction Motors driving the Exciters.
Nine 6600 Feeder Circuits ranging from 600 to 7000 kw.

Four blank sections are provided for four future generators and two feeders.

The other two illustrations show the 21-panel switchboard and the circuit-breaker structure in substation No. 2, which control the following apparatus:

Four 750 kw., 6600-volt, 3-phase, 25-cycle, 750-volt, D.C. Motor Generator Sets.
Four 6600-volt, 3-phase, 25-cycle Motor, ranging in capacity from 500 to 6000 h.p.
Four 250-volt, D.C. Feeders, ranging from 600 to 2400 amperes.

The oil-breakers are electrically operated. The carbon breakers and knife switches have laminated studs, permitting direct bolting of copper connections and risers to terminals.

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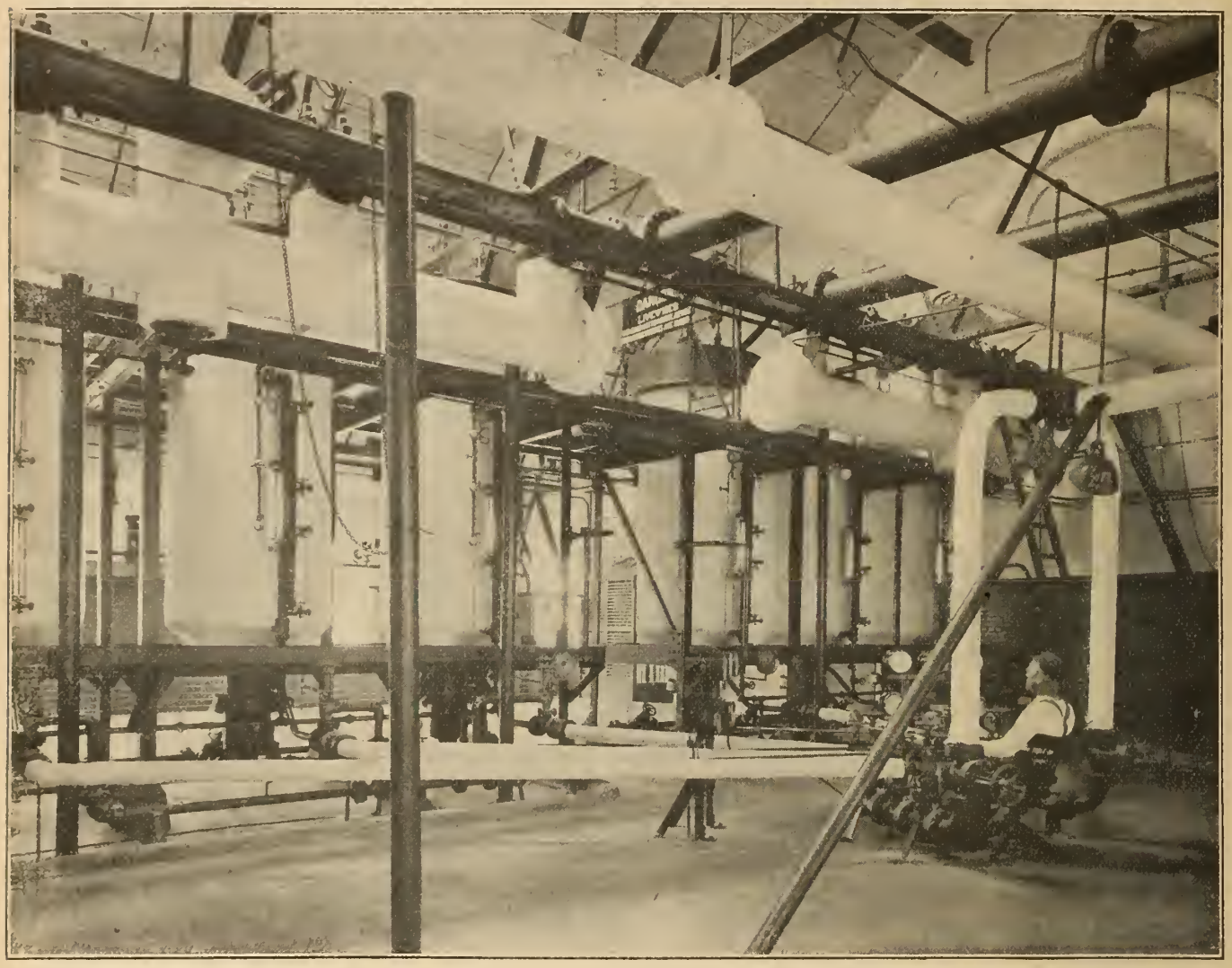

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22a

ONTARIO'S MINERALS

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

Hon. H. Mills, Minister

The following table, subject to revision, summarizes the mineral production of Ontario for 1921. As far as possible the figures represent quantities shipped and values received for marketed products. Tons throughout are short tons of 2,000 pounds. Final figures for 1920 are included for comparison.

Summary of Mineral Statistics, 1921

	Quantity		Value	
Metallic	1920	1921	1920	1921
Gold ..... ounces	565,283	709,509	$11,686,043	$14,624,085
Silver ..... "	11,065,415	8,412,059	10,873,496	5,497,160
Platinum metals ..... "	19,056	(a) 915	1,996,535	51,060
Copper ..... lbs.	6,825,772	3,070,719	1,041,994	356,708
Nickel, metallic ..... "	11,015,692	5,430,147	3,852,141	1,825,359
Nickel, oxide ..... "	4,890,571	1,402,019	1,151,490	285,391
Cobalt, metallic ..... "	167,750	32,718	392,926	98,228
Cobalt, oxide ..... "	569,182	155,554	1,210,810	354,418
Other Nickel and Cobalt compounds ..... "	161,442	108,814	16,991	114,069
Lead, pig ..... "	2,232,253	3,570,222	179,714	190,843
Copper in matte exported (b) ..... tons.	11,715	3,686	2,928,750	737,142
Nickel in matte exported (b) ..... "	21,371	4,850	10,685,500	1,939,851
Iron ore and briquettes (c) ..... "	68,616	100	60,958	459
Iron, pig (d) ..... "	67,164	82,318	2,204,205	2,079,729
Total metallic			$48,281,553	$27,574,202
Non-Metallic				
Actinolite ..... tons.	100	78	$ 1,160	$ 975
Arsenic, crude and white ..... lbs.	3,781,389	2,982,525	432,434	233,763
Clay products—				
Brick, common ..... M.	123,551	99,463	2,209,265	1,743,094
Brick, fancy and pressed ..... "	32,559	31,481	809,126	673,087
Tile, drain ..... "	9,784	9,910	359,373	250,040
Tile, roofing and building ..... tons.	58,737	.....	369,530	211,529
Pottery	.....	.....	127,049	67,985
Sewer pipe	.....	.....	860,811	939,464
Cement, Portland ..... bbls.	2,035,594	2,723,072	4,377,814	6,425,266
Corundum ..... tons.	196	402	27,000	50,250
Feldspar ..... "	37,335	15,506	268,295	114,059
Fluorspar ..... "	3,704	115	67,381	1,744
Graphite, crude and refined ..... "	1,956	363	132,882	23,273
Gypsum, crushed, ground and calcined ..... "	74,707	84,765	404,162	433,053
Iron Pyrites ..... "	148,651	19,375	618,283	91,604
Lime ..... bush.	4,982,912	2,610,129	1,799,763	1,172,680
Mica ..... tons.	717	222	51,394	29,630
Mineral water ..... Imp. gals.	127,150	.....	15,059	9,000
Natural gas ..... M cu. ft.	10,545,000	8,590,000	3,163,500	2,953,000
Peat ..... tons.	3,900	500	15,600	2,000
Petroleum, crude ..... bbls.	181,750	172,859	724,145	466,716
Quartz and silica brick ..... tons.	94,650	12,957	366,441	74,635
Salt ..... "	206,612	149,599	1,544,867	1,509,287
Sand and gravel ..... cu. yds.	2,162,241	1,412,956	1,390,704	668,098
Sand-Lime brick ..... M.	27,703	.....	407,766	456,700
Stone, building, trap, granite, etc	.....	.....	3,944,972	1,812,863
Talc, crude and ground ..... tons.	20,359	9,967	306,319	140,390
Total non-metallic			$24,795,194	$20,554,185
Add metallic			48,281,553	27,574,202
Grand Total			$73,076,747	$48,128,387

(a) Recoveries from Canadian refineries only.

(b) Copper and nickel exports in the form of matte were valued, respectively, at 12½ and 25 cents per pound in 1920, and at 10 and 20 cents in 1921.

(c) Exports and shipments to points other than Ontario blast furnaces.

(d) Proportional product from Ontario ore smelted. Figures cover only the first nine months of 1921.

Dividends and Bonuses paid to the end of 1921 amounted to $23,140,734 for gold mining companies, and $84,388,185 for silver mining companies, or a total of $107,528,919.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

For illustrated reports, geological maps, mining laws, and list of publications, apply to

THOS. W. GIBSON, Deputy Minister of Mines,
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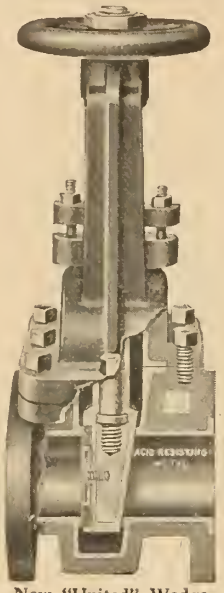

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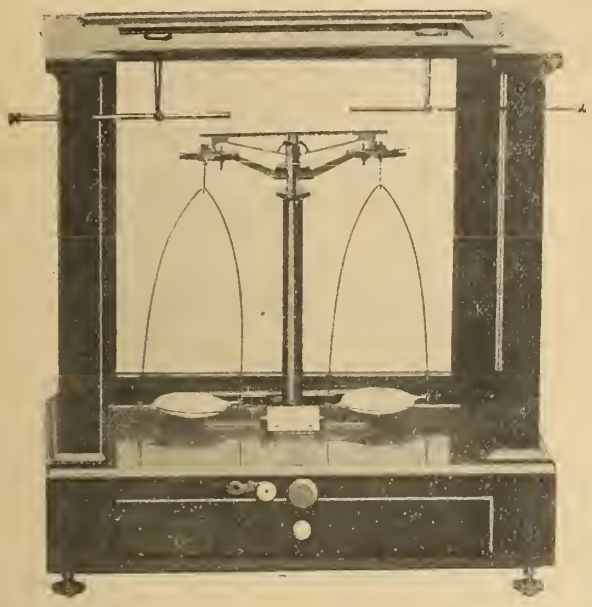

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BALANCE—Becker's Sons (Rotterdam), capacity 200 grams in each pan, sensitive to 1/20 milligram, beam of aluminum, 6″ long, divided on both sides into 1/10 milligram. The rider may be used on either side of beam. The bearings and knives are agate. Mounted on heavy glass plate in glass and mahogany case with glass top and counterpoised door. With riders, specific gravity support, weighing tube support with counterpoise, and key with which the drawer and door may be locked. This is Becker's Standard Analytical Balance **$135.00**

BALANCE—Becker's Sons (Rotterdam). Short aluminum beam, 6″ long, graduated to 1/10 milligram, capacity 100 grams, sensitive to 1/20 milligram. Bearings and knives of agate, mounted on heavy glass plate in glass and mahogany case with glass top. Beam with rider arrangement. With arrangement for arrest of beam and pans. When the balance is at rest the bearings and knives are not in contact **$100.00**

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Retorts, stoppered, 500 c.c.	0.45
Kipps Apparatus, 250 c.c.	2.50
Culture Flasks, Duclaux	0.50
" " Ruffer, A Form	1.50
" " Miquel, 100 c.c.	0.40
" " Pasteur, 100 c.c.	0.35
" " Willfahrt	0.30
" Tube, Pasteur, 100 c.c.	0.35
Vacuum Flasks, Dewar's, Silvered, 1000 c.c.	3.00
" " " 500 c.c.	2.50
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" " " " 3½ in.	4.00
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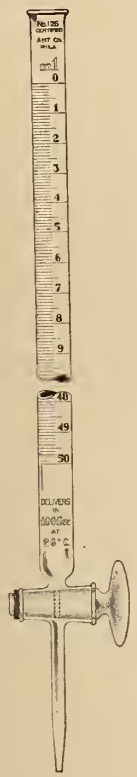
2447
Front view

2447
Back view

8155
Front view

8155
Back view

8163
Front view

8163
Back view

These **CERTIFIED BURETTES AND PIPETTES** are made exclusively for us from our own designs which are based upon the tolerances and fundamental specifications of the United States Bureau of Standards. While we, obviously, can claim no greater accuracy than other ware certified by the Bureau, we do offer a design and workmanship unequalled, in our judgment, in any other ware. We solicit a comparison of the merchandise in confirmation of this statement.

Burettes and Pipettes with **unofficial** certificates, while identical in workmanship and design with those with Bureau of Standards certificates, and usually within the Bureau of Standards tolerances, are not guaranteed always to pass Bureau of Standards certification. The unofficial certificate is particularly valuable as a check where re-calibration is to be undertaken in the laboratory.

Burettes and Measuring Pipettes with **Bureau of Standards Certificates** and Transfer Pipettes tested by the Bureau of Standards and engraved with **official** mark of certification (Transfer Pipettes are no longer furnished with certificate of error) are, of course, always within the tolerances established by the Bureau.

2446. Burettes, Certified, with straight glass stopcock. With unofficial factory certificate.

Capacity, ml	10	25	50	100
Graduation interval, ml	1/20	1/10	1/10	1/5
Each	**4.00**	**5.40**	**7.40**	**8.20**
2447. Ditto, but with Bureau of Standards certificate	**7.80**	**9.25**	**10.50**	**12.25**

8154. Pipettes, Transfer, Certified, with unofficial certificate.

To deliver, ml	1	2	3	5	10	15	20	25	50	100	200
Each	.60	.70	.85	1.00	1.10	1.30	1.40	1.50	2.00	2.75	4.00

8155. Ditto, but tested by the Bureau of Standards and engraved with official mark of certification.

Each	1.70	1.80	1.90	2.00	2.10	2.20	2.30	2.60	3.20	3.70	5.00

8162. Pipettes, Measuring, Certified, with unofficial certificate.

To deliver, ml	1	1	2	5	10	25
Graduation interval, ml	1/100	1/10	1/10	1/10	1/10	1/10
Each	**1.60**	**1.30**	**1.80**	**2.25**	**2.50**	**3.10**
8163. Ditto, but with Bureau of Standards certificate	**3.80**	**3.40**	**3.90**	**4.30**	**4.75**	**5.35**

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and
Many Others

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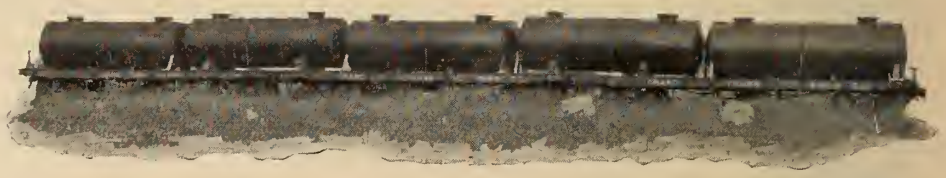
Power & Light Plants
Marine Fittings

"It pays to buy from the Firm that makes the best"



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FROM THE PUBLISHERS—

"CONSTANT READER" AND THE TECHNICAL PAPER

All of us are familiar with the letters that appear frequently in the "Letters To The Editor" column in the daily newspaper from "Constant Reader." Probably one should say "have appeared" for these writers are choosing more fantastic noms de plume of late such as "Veritas" or "One Who Knows." Poor "Pro Bono Publico" has almost entirely vanished, while an increasing number of letter writers are becoming more courageous and are signing their real names.

In comparison with the newspaper, the technical journal receives but few letters for publication, and the few that do appear are nearly always signed with the writer's name. Such letters form a valuable section of many modern technical papers and are generally evidence of keen interest by the reader in some important question concerning his particular profession or field.

There is another class of letter that is always welcomed by a progressive editor. We refer to letters, generally not for publication, but giving suggestions for improvement in the journal's make-up. These letters may be critical—all the better for that—but they invariably prove helpful in making the journal more "to the reader's taste"—which is the goal to be desired. Unfortunately readers seem to hesitate about sending on to the editor criticisms or suggestions about the paper.

Look over this issue. Are there any improvements you would suggest? Any new feature you would like to see added or any change at all in either the character of the contents or the make-up? If so, drop us a line outlining your suggestions. This paper is published primarily for You the reader. Tell us what you would like and we will make a real effort to give it to you.

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Issued on December First

Rapid Method for the Determination of Phosphorus in Brass and Bronze, by J. Casner and Wm. Kuebler; Determination of Alcohol in Mixture, by Simon Mendelsohn; An Improved Burette Jet, by Wilfrid B. Ault; Notes on the Determination of Sulphur in Iron and Steel, by Henry W. Kasper; Quantitative Determination of Carbon Dioxide, by J. T. Donnelly; The Use of Alundum in Connection with Calorimetric Determinations, by Paul F. Hoots; An Improved Volumetric Method for Determining Sulphur in Iron and Steel, by Sylvester A. Weigand; Determination of Zinc in Fluorspars, by W. V. Brumbaugh; Good Practical Methods for the Determination of Molybdenum in Steel, by S. Little; Method for Determination of Uranium in Steel, by S. Little; The Determination of Nickel in Steel, by Robert J. Peters.

EDITORIALS

THE EDUCATIONAL PROBLEM AS A FIRST STEP IN RESEARCH

WELL-MEANING efforts have been put forward continuously during the past five years by a number of leading teachers of science in our universities and a few far-sighted business men, who are unselfishly anxious about our industrial developments, with the general aim of producing an organization that would make possible various lines of research activities as national undertakings.

Granted that the results of their labors so far have not been great, that methods adopted may not have been perfect, and that some of them perhaps did not see so clearly as might be desired, or reason always in a logical manner, the outstanding, obvious condition has been disclosed, namely that until a vast amount of educational work has been accomplished, little progress can be made.

As long as one manufacturer believes that we should have a research institute to analyze his coal, preferably at no cost to him, and another thinks that the Government might well supply, through a consultant engineer, someone who will keep him up to date, tell him about the progress another is making, and generally carry his technical worries, we have entirely missed the mark. No Government will be foolish enough to mistake its function in such a manner.

We believe that the Canadian Manufacturers' Association is in a fair way to become an educational force of value to its members. A recent meeting in Ottawa demonstrated interest at least on the part of that body, and while we do not quite see why any action from the Dominion Government is necessary to promote practical means of assisting their interests, we do think that if this Association would embark on a sound, progressive, educational policy for industrial research, the Government would become an active partner.

It is impossible to believe that any research work that the Dominion Government can rightfully undertake, if of general value to everyone, will be of sufficient particular value to anyone to be immediately worth while. In theory, at least, either the Government must become responsible for pure research only, or take over the task of leading all and sundry interests in the country in business promotion work. No one expects that the latter should be undertaken, and yet propositions are presented continually which would leave the Government committed, should they undertake the task.

The general tendency of adding all kinds of activities to Governments, in addition to their pure governing functions, is creating a type of paternalism and a haziness of thought on such matters that is most confusing.

The whole idea is so gigantic that any examples taken are, of necessity, very special cases. Canadian textile industries are a fair average. Here a very few companies command the situation. It is true that there are hundreds of smaller concerns, in various branches of the industry, but, on the whole, the textile industries of Canada are directed by a relatively small number of individuals, who, if they were so disposed, could from the profits, or as part of their ordinary expenses, carry on any kind of research work they might desire, or enter into specific educational tasks designed to supply them with better trained employees.

Why should an industry, that can organize itself to such a high degree in all matters relating to trade and finance, require the Government to show them the way in research, unless it be that there is some faint hope that in the shuffle, they will receive more than they give, and that those who are interested in the tanning industry, as an example, will help to pay some of the taxes that go to assist research in the textile field. If the companies in an industry cannot agree to solve common problems for their general good, why should they expect that the Dominion Government will undertake it?

What our Canadian manufacturers, producers of raw materials, and agriculturists need greatly, is a course of training in the ability to grasp their own general requirements and problems as related industries. If they would but become acquainted with the genesis and developments of those applications of science which have put them where they are, and come to a realization of fundamentals, they would, as a natural consequence, at once desire to keep flowing these sources of their strength and usefulness. It may be the business of the Government and educational forces generally to point these things out, but it is not the business of any Government to keep going something that is well able to look after itself. Research generally involves creation, and in this role a Government may appear to advantage in particular cases; but, for the most part the things which require doing because of the probable volume of immediate, practical results, are simply awaiting the touch of the capital already invested in the industry and profiting considerably thereby.

CHEMISTS AS POPULAR WRITERS

SCIENCE Service, which is an all-American newspaper service, operated by competent people, is doing much to help the press improve the tone of its news, when handling reports of progress in a popular way. The American Chemical Society is very actively engaged in something along the same line, and their free service has brought to the attention of millions, the development of business from the chemical angle, and has given the world authentic, readable accounts of chemical activities. While free to Canadian papers, this service is not used to any great extent, because it deals particularly with affairs of interest only to the United States.

A little while back, we mentioned the work of Mr. H. Freeman, in the Vancouver papers, and more recently we have noted the efforts of Ottawa chemists in their local press. This is good work, and there may be other chemists who have been exercising their literary abilities. To all these, we would bring words of encouragement. The difficulties of organized methods of carrying on this work are a little beyond the abilities and funds of our chemical organization. In many cases this may be quite as well accomplished by indiduals Yet many things are worthy of national mention. We still await the appearance of a leader in Canada, who, through the development of a suitable style, and the discovery of a happy method of treatment which will not rest entirely on inspirational moments, may be able to attain some volume to literary contributions of this type.

THE CANADIAN INSTITUTE IN INTERNATIONAL AFFAIRS

INSUFFICIENT publicity has been given in Canada, and possibly throughout America, to the development of the International Chemical Union. It is true that this is an association of the allied nations only, but, as such, is fairly representative, with one outstanding exception.

Probably the reason for the lack of interest on this side has something to do with our general inability to think in international terms. Our neighbors are supposed to be peculiarly insular in this regard, and Canada is on about the same basis, except when matters relating to wars are up for discussion.

Quite without any general premeditation on their part, the Chemists of Canada became represented in this international activity, through the Canadian Institute of Chemistry. That Institute, in turn, had sufficient to do at the time to place its own house in order and had little remaining energy to direct its attention beyond its own borders.

Now the situation is somewhat changed. The Canadian Institute has reached a reasonably stable mode of living, and its machinery appears to be in fair operating condition. As a result, perhaps a dozen prominent Canadian chemists have been given an opportunity to serve on international committees, and there is no reason to believe that they cannot exert as desirable an influence as an equal number from any other country.

Even the most selfish viewpoint would justify a continuance of these activities, although there may indeed be some point to a more general distribution of the cost of the representation. Those chemists who have a little wider viewpoint than the average, and are more willing to carry the extra burdens, are certainly to be commended for their willingness to carry forward such work, and those who have not followed international chemical affairs, or have no personal interest in such matters, should feel reasonably grateful that there are people who find the time to do such things for them.

As the whole idea of getting together in international chemical work grows, this may become a really important part of the general activity of the only Canadian organization capable of representing Canadian chemical opinion abroad.

IMPROVING LABOR CONDITIONS

THE latest Government statistics show considerable improvement in the unemployment situation. There are certain signs that chemists come to know, that have a bearing on their labor market. Those who sell laboratory supplies note increased industrial sales, and chemical employment bureaus are actually securing occasional inquiries for men. As a rule, times are very brisk before Companies find it necessary to make many inquiries for junior chemists. Not a few chemists were cut off with slight notice, during the worst of the industrial slump, and a rather mean advantage of the situation was taken with not a few salaries. Chemists have suffered to a considerable degree from their inability to impress employers either by the method of ordinary labor or the means used by closed professional corporations.

The situation is now much more hopeful. After all, Canadian industries are well adapted to chemical control, and we should have as high a proportion of trained chemists in our population as any other country. Opportunities for recent graduates in the United States may be much less than they were, but there are five positions at home to the one there was, even ten or twelve years ago. Our mineral and pulp and paper industries in particular keep on consuming properly-trained graduates at an increasing rate, and chemistry is rapidly

becoming a proper course to take as an introduction to a great variety of business activities. What amounts to a mild boom in some industries in the United States had helped the situation everywhere, and all signs point to a little brighter future for the chemist who has but recently arrived. It is still a buyer's, rather than a seller's market, but still some business is being done.

NEED FOR RESEARCH ORGANIZATION EMPHASIZED

For three days, February 20th, 21st and 22nd, representatives of the universities, government departments, Canadian Manufacturers' Association, and of companies who already have research laboratories, met in conference at Ottawa, to discuss the present status of research in Canada, and particularly to bring out ideas for a wider application of research work. The conference was held under the auspices of the Canadian Manufacturers' Association. The contributions from the various sections were most illuminating and showed that the amount of research work in Canada was much greater than would be generally supposed.

Addresses were given descriptive of the work carried on by the Advisory Council by Dr. Adams, Col. Gaudet, Dr. Ruttan, Dr. Macallum and Mr. Hume Cronyn. Research work of the Department of Agriculture was outlined in addresses by Dr. Frank Shutt, Dominion Chemist, and Mr. J. H. Grisdale, Deputy Minister. Mr. Devile gave an address on Standardization in the Department of Trade and Commerce, and the research work in the Department of Mines was described by Dr. Camsell and others. The research work carried on at the universities was described by representatives. Professor J. W. Bain represented the University of Toronto and Dr. R. F. Ruttan, McGill University. An account of the various industrial activities of the University of Manitoba was given by Dr. Shipley. A number of manufacturers took part in the discussions, including Mr. T. H. Wardleworth, of the National Drug and Chemical Co., and Mr. A. Neigborn, of the Nichols Chemical Co. Almost every speaker expressed a strong desire to see a proper Research Institute established in Canada.

On Thursday evening, February 23rd, a banquet was held at the Chateau Laurier at which were present: Sir George Foster; Hon. F. A. Robb, Minister of Trade and Commerce; Sir Clifford Sifton; Hon. Charles Stewart, Minister of the Interior; Dr. F. B. Adams, of McGill University; W. H. Miner of the C.M.A. Mr. T. H. Wardleworth, of Montreal, presided.

Sir Clifford Sifton was the chief speaker of the evening, who by reason of the fact that he was the originator of the Commission of Conservation and a keen student of industrial problems was able to speak with some authority on the proposal to bring about co-operation in industrial research effort in Canada. Sir Clifford made some heroic suggestions with regard to handling the whole problem, many of which may be acted upon. The question, he thought, resolved itself down to one of organization An organization should be formed carefully and systematically.

An attempt had been made to bring about co-ordination between the university and government departments of research by the establishment of the advisory council of research. The council was doing its best. Dr. McCallum after a few years' effort had resigned. His successor had done likewise and now Dean Adams, of McGill had taken over the position in conjunction with his other duties.

"It can't last for ever," said Sir Clifford, "because no man can give his attention to the council and carry on his own duties as a university professor.

"The chairman is called upon to do everything and to bear all responsibility on all subjects. Dean Adams is a geologist, but under present conditions he must take responsibility for all branches of research and he must go to a minister and ask for money for the carrying on of his council. It is an intolerable position. An archangel couldn't perform the task assigned to him."

The collating of scientific data from other countries where laboratories had been long established, he regarded as one of the duties of the proposed institute.

"There should," he declared, "be a central institute in Ottawa embracing all departments covering applied science. The government, he said, should delegate to a board of governors control of the institute just as the British government has delegated to a board of governors control of the British museum.

"The board in question," said Sir Clifford, "should consist of about twelve men. The chairman should be a man of both scientific and business ability. Half of them should be men of eminent scientific qualifications with administrative training. There should be three engineers and three or four manufacturers or business men." So far as the executive was concerned he would have them all Canadians. So far as the 'experts' were concerned he wou'd seek them from whatever country could best provide them If we can get them in Canada, let us get them here," he declared. "If not, get them where they can be got."

It is the intention o the Canadian Manufacturers' Association to publish in pamphlet form, the proceedings of the conference.

THE CHEMICAL ELEMENT: HAFNIUM

It is reported that Coster & Hevesy, of Copenhagen, have definitely determined the presence of a new element, atomic number 72. Their proposed name is "Hafnium." Applying the method of Moseley, involving measurement of X-ray spectra, obtained from extractions of Zirconium minerals, this new element was definitely observed. This element was forecasted by Thomsen of Copenhagen, in 1895. It is thought that some Zirconium ores must contain as much as 1%, while others run from 0.1% to 0.01%. The pure element has not yet been isolated.

It comes between lutecium atomic weight 174 and tantalum atomic weight 181. The elements discovered since 1900 are: Europium, by Demarcay, in 1901; Radium, by the Curies, in 1902; Dysprosium, by Urbain and Demenitroux, 1907; and Lutecium, by Urbain, 1908.

There are other claimants for the distinction of the above discovery. Prof. G. Urbain some years ago, announced the discovery of a new rare earth element which he called "Celtian" which was thought to fill the vacant place in the series. according to work within the past few months as announced by A. Danvillier.

Coster & Hevesy claim their element is not of the rare earth type, and it may take some time and further work to clear up the dispute in question.

EXPLOSIBILITY OF AMMONIUM COMPOUNDS

At the Pittsburgh, Pa., experiment station of the United States Bureau of Mines small scale tests of ammonium nitrate are being made to determine its explosibility by means of boosters only. The tests will be made at normal temperature with the ammonium nitrate at normal density and with such a degree of confinement as is found suitable from preliminary tests. The compression of small lead blocks will be used as the criterion of explosibility. The use of the following explosives as boosters is contemplated. Picric acid, Tetryl, TNT, TNA, amatol 80/20, high grade ammonium dynamite, blasting gelatin and 40 per cent. ammonia dynamite. This work is being done in co-operation with the National Research Council who will direct further work on the problem.

The Work of Dominion Government Chemists---I.

The Chemist in the Department of Mines.*

THE work of the chemist in the Department of Mines must naturally depend on the nature of the functions of the Department itself, and to explain these, it is necessary to refer briefly to its organization.

The Department of Mines was established on its present basis by the Geology and Mines Act, 1907. By the provisions of this act the Geological Survey, founded in 1843, was divided into two branches, the Geological Survey and the Mines Branch. Each branch has its own Director and administrative and technical staff, although under one Minister and Deputy Minister.

The functions of both branches were laid down in detail in the Act. Summarized very briefly the Geological Survey is interested with the study of the Geology and Mineralogy of Canada, while the Mines Branch is concerned with the Investigation and development of the mineral resources from the economic standpoint. It follows therefore that the majority of chemists will be employed by the Mines Branch.

The Organization of the Mines Branch

To carry out these functions there are at present five divisions:

The Mineral Resources Division,
Ore Dressing and Metallurgical Division,
Fuels and Fuel Testing Division,
Ceramic and Road Material Division,
Chemical Division.

Each of these divisions has provision for chemists on its staff.

The Mineral Resources Division

The mineral resources division, besides collecting detailed information and statistics on mineral deposits, mining operations and market conditions in Canada, carries out many special investigations on various phases of the mineral industry. Examples of such work at present in progress are:—

The development of chemical and metallurgical industries in Canada.

Molybdenum, its occurrences, production and uses.

Mineral pigments in Eastern Canada.

Sodium sulphate deposits of Saskatchewan and Alberta.

Bituminous sands of Northern Alberta.

Fossil resins in western coals.

For these studies much analytical work is required, besides special experimental work on new processes and methods. All this work requires the attention of chemists, either of those attached to the division or of the chemical division.

Ore Dressing and Metallurgical Division

The ore dressing and metallurgical division is concerned chiefly with special problems connected with the milling, concentration, separation and metallurgical treatment of Canadian ores. During 1921, tests were made on the treatment of gold ores from Manitoba, the concentration of garnet from its rock, the concentration of low grade copper ores, the concentration of low grade nickel-copper ores of Ontario. Other subjects of investigation are the concentration and separation of fluorite, the possible recovery of metals of the platinum group from placer concentrates and from certain copper-nickel ores, the use of Canadian-made flotation re-agents, the production of electrolytic iron from pyrite and pyrrhotite and the removal of impurities from coal by washing and flotation. The list could be extended almost indefinitely.

The chemical staff of this division consists of five chemists and assistants and their work varies from the simplest of qualitative analyses to complete quantitative mineral separations, such as are required in following the various processes in the mill.

Besides this work there are always small scale tests and special chemical methods under investigation.

The Fuels and Fuel Testing Division

This division has the largest chemical staff of any in the department, comprising a chief, four chemists and two assistants besides the necessary laboratory help.

Their work is in part analytical, such as is required in the carrying out of boiler trials, runs of the producer gas plants, and tests of household furnaces, etc. The coals of Canada are being systematically analysed; lubricating oils and gasoline samples are examined. But much of the work is of an investigatory nature. The following problems are illustrative. The determination of the physical constants of coals such as ignition temperature and specific heat, the development of a standard laboratory method for testing oil shales, tests of different processes for retorting oil shales, the carbonization of lignite and peat and the reactions that take place, studied from a physical standpoint, the properties and behaviour of lubricating oils under special conditions. These are merely indicative of the type of investigations carried on and the list is by no means complete.

The Ceramics and Road Materials Division

This division has charge of the development and investigation of Canadian clays and other materials used in ceramic industries. Up to the present most of the work has been the locating of deposits and the testing of samples. The same may be said of the road materials laboratory in which mainly physical and empirical tests are carried out. There is no chemist as yet on the staff of this division and most of the chemical work required is done by the chemical division. There is undoubtedly a big field for chemists in this line as the ceramic industry is rapidly being put on a scientific basis and more and more requires the work of the physical chemist.

The Chemical Division

The staff of this division consists of a chief, three chemists, two assistant chemists and laboratory assistants. The work carried on is of a very varied nature. Many samples of rocks, minerals, alloys, waters and gases are sent in for identification or for quantitative analysis. For example, 754 samples were dealt with in 1921. On account of the present activity in gold mining, many assays are now required. Another phase of work is the analysis of samples of air from coal mines, several hundred being examined annually.

Special investigations also receive attention. At present the peculiar properties of the colloidal clay, bentonite, so common in the west, are being studied. Another problem is the use of natural gas as a raw material for the production of industrial chemicals. The air drying of peat has been under study for some years.

The Explosives Branch

This branch of the Department of Mines was established by The Explosives Act of 1914, and its functions are to regulate the manufacture, importation and use of explosives in Canada. One of the chief members of the staff is naturally a chemist, and his duties are very varied and important, ranging from the investigation of accidents where explosives are concerned, the inspection and licensing of explosive plants, and the examination of all types of explosives. He is assisted by a chemical staff.

The Mineralogical Division of the Geological Survey

The work of chemistry in the mineralogical division of the Geological Survey comprises: The analyses of rocks and

* EDITOR'S NOTE—These articles were prepared for presentation at a meeting of the Ottawa Section of the Society of Chemical Industry, but it is felt that as most people, even within the chemical profession itself, have little knowledge of facts presented it is well to give them a wider circulation.—The Editor.

special minerals for the purposes of petrographic study, grouping of rocks, and new rock types. The comparison of rocks and rock magmas with similar deposits in other parts of the world, on which petrographic and chemical studies have been made.

Chemical analyses of new minerals, and others from new localities in Canada, analyses of rare earth minerals, analyses of meteorites. The methods of analyses employed are based on those of Hillebrand supplemented by special methods developed in this laboratory."

The attention of the staffs of these laboratories is also often given to problems of a chemical or physical nature submitted by other Government Departments. Instances of these during 1922 are: Work on glues, varnishes, plywoods and aeroplane fabric dopes for the Air Board, oils and fuels for the Militia and Naval Service Department. Several investigations were also carried out for the department of Interior and Marine.

Laboratories and Equipment*

There are altogether five laboratories in which chemical work is carried out in the Department of Mines. They are well equipped with the most modern types of chemical apparatus. There are also many pieces of valuable physico chemical apparatus such as spectroscopes, spectrophotometers, thermocouple standardization apparatus, high vacuum pumps, electrical and volumetric types of gas analysis apparatus, etc. There is a good micrographic outfit and an X-ray apparatus. There are four branch chemical libraries apart from the main departmental library. A completely fitted machine shop, carpenter's shop and a good glass blower afford every facility for the manufacture and repair of special and ordinary apparatus and save tedious delay and considerable saving of money.

The Desirable Qualifications for a Chemist in the Department of Mines

The first requisite is a thorough and broad University training in chemistry and the allied sciences. Added to that, some post-graduate work at a University, coupled with some experience in a metallurgical or mining plant is most desirable.

Work requiring specialization in organic chemistry is infrequently met with, and a more complete knowledge of inorganic or of physical chemistry is perhaps the more useful of the main branches of chemistry.

The number of chemists employed in the Department of Mines has risen from three in 1910 to twenty in 1923, and with the increasing development of Canada's valuable mineral resources the number must rapidly grow. The salary paid is not sufficient—what salary ever is—but it enables a man to live fairly comfortably. The work is interesting and there is every opportunity for original investigation and publication of results. The Government service offers a fair career for a chemist who has no desire for riches. One criticism that might be offered is that in the scattering of the laboratories and staff, the incentive and competition that arise from a body of men working side by side is lost, and one more easily falls a victim to the bane of all government service, lack of enthusiasm and real vital interest.

*Description of the laboratories of the Mines Branch of the Department of Mines. Bulletin No. 13, 1916.

RADIUM FROM MADAGASCAR

It is authoritatively stated that some two years ago French inhabitants of Madagascar drew attention to the fact that Madagascar was rich in radio-active minerals: in view of this report, experts were sent to prospect, and found that the Manandona region was rich in uranite (uranium phosphate). Exploitation of these deposits has been begun; and last year nine tons of uranium oxide were exported, as result of this exploitation. It is confidently believed that eighteen tons will leave Madagascar this year, and it is hoped that in the near future the Island will be able to supply half the quantity of radium produced in the world.

CLEANING ALUMINIUM UTENSILS

A solution of the problem of cleansing aluminium, which has hindered its adoption in kitchen and factory very appreciably, seems to have been reached, as explained in a paper recently read before the British Institute of Metals, giving results of research by two of its members, Richard Seligman and Percy Williams. The difficulty has been that the metal is freely dissolved by hot soda solution, which is the most common detergent. For instance, a solution containing 5 per cent. of Na_2CO_3, 10 H_2O, dissolves 53,000 mg. at 75 degrees C., while at boiling point a 1 per cent. solution dissolves 80,000 mg. In the cold, under certain conditions which commonly arise, discoloration of the metal and "pitting" readily takes place. This defect has been so general that the slogan for aluminium producers has been "Use No Soda."

Such precautions become unnecessary if the simple device be adopted of adding very small quantities of sodium silicate to the soda. This result has been arrived at in the following way. Some years ago, it was found that water glass solutions did not affect aluminium and its detergent qualities suggested it suse as a cleanser, however its inconvenient form prevented its general use. The chemical reaction which took place was as follows: The aluminium, at first, superficially dissolved by the alkali in the water glass, becomes coated immediately by an insoluble protective covering of colloidal aluminium silicate. Working from this, it has been proved that if aluminium be placed in a cold solution containing 0.1 per cent. of caustic soda, attack accompanied by visible evolution of hydrogen commences in a few seconds. If, however the aluminium be first immersed in a boiling 1 per cent. solution of sodium silicate and then, after washing, plunged into the same caustic soda solution, the attack is retarded, the degree of retardation depending upon the length of the immersion in the silicate solution, and reaching its maximum (about an hour to an hour and a quarter) after a preliminary immersion of thirty minutes. It would therefore seem probable that the presence of even small quantities of sodium silicate in soda solutions would produce the same effect as water glass, and as cleansing powders consisting of mixtures of soda and sodium silicate are procurable under various trade names, the solution of the problem has been reached. The only safeguard to be observed in using these mixtures is that enough of the sodium silicate must be used to leave some of the silicate over after the lime salts, etc., present in the water have been saturated, and that after the cleansing operations the detergent be completely washed away.

DURABLE STAIN FOR WOODWORK

A new German patent is as follows: A solution of 1 kg. of commercial deep-brown stain (Cassel brown, consisting chiefly of alkali humates) in 30-40 parts of water is filtered and heated to boiling, and about 5 litres of a 2 per cent. of ferric chloride are stirred in, in a thin stream, until the mixture will filter easily and the filtrate shows an excess of iron. After decanting as much of the liquid as possible, the remainder is passed through a bag filter, and the solid residue is dried on porous clay plates, or in vacuo, until the paste, mixed with a little ammonia, forms a stain ready for use. This stain soaks well into the wood, and on evaporation of the ammonia becomes insoluble through the decomposition of the complex ferro-ammonium compound of humic acid.

PORCELAIN MANUFACTURE IN INDO-CHINA

The beginning of a national porcelain industry at Tonkin is announced. Indo-China itself promises to be the principal sales outlet. The local Government is supporting the venture by giving the orders for supplying the Post Office with electric insulators.

The Manufacture of Varnish*

A Short Discussion on Varnish Making with Particular Reference to Oil ---Resin Varnishes

By G. N. Hill†

A VARNISH is a liquid preparation which, when spread out in thin layers, dries by evaporation, chemical action or both to form a hard, transparent and glossy film. Varnishes are used to communicate lustre and brillance to many different kinds of dressed surfaces, to beautify them or protect them from the influence of air, moisture and other deleterious agents.

The general exceptions to the above definition are the so-called "Flat Varnishes" which dry with a more or less matt surface, and yield a more or less opaque film.

The chief requisites of a good varnish are that it forms a firmly adherent layer on the surface over which it is spread, that it dries quickly and hard, yet with sufficient elasticity and tenacity not to crack with changes of temperature—that it forms a durable surface.

The materials which almost exclusively form the permanent body of the varnish are the resinous substances and the drying oils.

Classes of Varnishes

Varnishes may be divided into four groups according to their composition and properties:

1. Natural Varnishes.
2. Oil Varnishes.
3. Spirit Varnishes.
4. Water Varnishes.

The first group comprises the natural lacquers of India, China and Japan, which issue from the tree in liquid form and only require application to the prepared objects to varnish them.

The second group consists of varnishes made from resins of various kinds dissolved in oil, and on the North American continent in particular, forms by far the most important of the groups.

The third group includes the varnishes made by dissolving resins in volatile solvents of various kinds; on application of the varnishes the solvent evaporates leaving the resin behind as a lustrous coat.

The fourth group embraces a few varnishes made by dissolving resins and gums in water or weak alkaline solutions. The uses of these are very limited.

Oil varnishes may be roughly divided into two classes according to the relative proportions of the principal components.

Short oil varnishes are those which contain a large amount of resin and a small amount of oil—a typical example of which would be the polishing varnish of the piano and furniture manufacturers.

Long oil varnishes are those which contain a large proportion of oil and a small amount of resin. A class to which railroad coach and auto finishing varnishes belong. There is no sharp line of demarkation between the two classes, as varnishes may contain anything from two or three gallons of oil per hundred pounds of resin to as much as a hundred gallons of oil to the hundred pounds of resin.

The classification, however, holds good for the majority of varnishes, for as a general rule the varnishes used for interior finishing and decoration belong to the former class, whilst the varnishes used for the decoration and protection of objects exposed to the elements belong to the latter class.

The Development of a Varnish Formula

The perfection of a formula represents the expenditure of a great deal of time on the part of highly skilled workers, and the expenditure of much money on raw materials.

A successful formula is rarely an accident. It is almost invariably the result of a long extended series of experiments.

The cost of such a formula is, therefore, great, which frankly explains the reason for so much secrecy in an industry wherein the fruits of labor cannot be commensurately protected by patents, copyrights or other legal safeguards.

Occasionally the novice stumbles on to some new product, but in the vast majority of cases the desired results are secured only after well thought out, carefully planned, and exhaustive study and experimentation, and a series of efforts which have come to be known by the definite term Research.

In spite of the vast inroads of science into industry, the manufacture of varnish is conducted even to-day largely upon an empirical basis.

The methods of the scientific worker of inference, deduction and prediction are only with difficulty brought into play. His efforts have developed most successfully in the devising of physical and chemical means for the determination of the purity of raw materials and the standardization of finished products.

With the exception of the class of so-called "Driers" comparatively little is known of the chemical composition of the principal raw materials of the industry—particularly is this so of the resinous substances or gums.

Of the mechanism of the reactions which take place when a kettle of gum is "run," when a batch of oil is polymerised or bodied, or when a film of varnish dries, much remains to be learned.

Valuable work has been done, however, in recent years in the laboratories of the larger manufacturers and refiners of raw materials and in the laboratories of the larger corporations in the industry, a pleasing feature of which is that much of the knowledge gained has been disseminated for the benefit of all interested in the industry. The work carried on in the laboratories of the Institute of Paint and Varnish Research under the guidance of Dr. H. A. Gardner is especially to be commended.

Varnishmaking

The manufacture of varnish as it is carried on to-day is achieved by a series of comparatively simple operations.

A weighed quantity of resin, usually from 100 to 200 pounds, is placed in a large copper vessel which is heated over an open fire until the resin is melted. Oil, in a predetermined amount and usually at a temperature of from 200° to 300° F. is added slowly to the melted resin, and the whole heated until perfect combination or solution is obtained, driers are then added—if these have not already been incorporated with the oil—and the batch cooled and thinned by the addition of turpentine or other suitable medium. The varnish is allowed to settle in order that the heavier portions of undissolved matter may separate out, and then filtered by either means of a filter press or with a centrifugal clarifier. The varnish is then pumped into storage tanks and allowed to "age" for periods which vary from a few months to several years according to the uses to which the varnishes are to be put.

The final value of the product, whilst depending largely upon the careful selection and refining of raw materials, depends even more upon the skill and care with which the various operations are carried out.

The Origin of Resins

The resins most highly prized in varnish making are the semi-fossil resins or copals. These resins are not gathered from living trees, but are taken from the ground, usually in localities from which the original trees have long since disappeared.

*Paper presented at meeting of Toronto Club of Paint and Varnish Superintendents, December, 1922.

†Chemist, The Imperial Varnish & Color Co., Ltd., Toronto.

The regions from which these resins are principally derived are the north and east coasts of Africa, the Congo, and the northern island of New Zealand.

The resins are the hardened exudations from trees, they are extremely complex in composition and have been considerably modified by their prolonged stay in the earth. They consist principally of resin acids and unsaponifiable matter, with smaller proportions of volatile oils (terpenes) and a fraction of one per cent. of ash.

The resins in their natural state are for the most part insoluble in oil or turpentine and need to be subjected to heat treatment in order to render them soluble. This process of torrefaction, or as it is known in the industry—"gum running" is distinct from the mere melting of the resin. The resins require treatment at temperatures varying from 600° to 700° F. and lose from 10 to 30% of their weight by volatilization before the operation of running is complete, the amount of loss being directly proportional to the degree of fossilization and hardness of the resin. It is also interesting to note that there appears to be a constant figure for each class of resin, as representing the minimum loss in weight which must occur before complete solubility of the residue in oil is obtained. The fused gum is, however, not soluble in oil with the same facility as is the case with many other products possessing the same range of solubility in differing concentrations. Thus for example, in the preparation of a long oil varnish, if the whole of the oil be added at one introduction with consequent lowering of temperature chilling of the gum would be induced with its prompt precipitation.

In practice, as already indicated, the oil is added in a heated condition and in small quantities. The temperature of the mix is raised until a test sample shows by its clearness that complete union of the two has been effected, when a further quantity of the oil is added and the operations repeated until the whole of the oil required has been introduced. The remainder of the treatment necessary to convert the resin and oil combination into a finished varnish is the addition of a suitable volatile diluent to render the product easy of application, and the acceleration of its drying properties by the introduction of a drier. The viscous oil-resin compound is removed from the source of heat and allowed to cool to a temperature in the neighborhood of the boiling point of the solvent used.

The addition of the thinner is then made, care being taken that thorough stirring during the addition is made in order not to chill locally, particles of the product. The quantity of thinner necessary will vary and depends not only on the viscosity desired for the finished product, but on the intrinsic degree of viscosity of the oil resin compound before addition of thinner.

The Addition of Driers

The acceleration of the drying properties in the product is obtained as already stated by the addition of a compound of one or more of those metals used to promote the drying properties of oils, e.g., lead, manganese and cobalt. The introduction of these into the varnish may be made by the addition of an organic compound of the metal soluble in the finished varnish, i.e., lead, manganese or cobalt "linoleates," rosinates or acetates, etc., to the product after thinning or alternately by causing union of the metallic base with the oil-resin compound at an elevated temperature usually at the completion of the "cook" and previous to cooling for the introduction of thinners. In this latter case the base combines partly with free, fatty acid or resin acid and partly saponifies the neutral glyceride of the oil.

In addition to the method of adding driers as described above, another method has found a certain amount of favor with some manufacturers. This consists of the addition of insoluble driers to the finished varnish, solution being affected by long agitation in drums or tanks. This method has the advantage of yielding considerably paler products, probably by reason of the sensitiveness of the metallic soap to darkening at the elevated temperature of solution obtaining in the "cooking method."

A cloudiness frequently develops in a varnish a few hours after it has become quite cold. This turbidity is due to the precipitation of insoluble "lead soap" of the saturated fatty constituent of the oil, e.g., stearic, palmitic and myristic acids—this may be removed by filtration or allowed to settle during the "ageing" process when a clear varnish will be obtained.

Simultaneously with the clearing process other and more obscure changes will occur, chief amongst which will be a slight bleaching of the varnish. Certain undefined physical changes also take place during "ageing." These are probably connected with alteration in the arrangement of the disperse phase in the colloidal solution, changes which can be observed and collated with changes of viscosity have been mentioned in a paper by Seaton Probeck & Sawyer, a change which manifests itself to the ordinary observer by an improvement in flow.

Varnish Thinners

In connection with the general properties of the finished varnish, the influence of the particular volatile solvent employed for thinning should be considered. At first sight, it might appear that little if any influence would accrue from this source since the presence of such in the varnish is transitory. Considerable discussion as to the relative merits of turpentine and its more popular substitute—naphtha or petroleum distillate, has taken place of recent years in technical circles. From a purely physical standpoint in regard to flash point, rate of evaporation, range of distillation, etc., properly prepared substitutes compare favorably with turpentine, but a feature that requires very careful consideration is the considerably lower solvent power of the petroleum distillates. This point is particularly important when dealing with short oil varnishes. Such varnishes require considerably more skill in manipulation, particularly during thinning, as the relatively instable combination of resin and oil renders the former very liable to precipitation by careless addition of the inferior solvent. The lower solvent power of the substitute also has an adverse influence on the manipulation of the varnish under the brush, a harshness or pull developing, due to partial precipitation as evaporation proceeds. This disparity between the solvent power of turpentine and the petroleum distillates is perhaps even more marked in the action upon polymerised and oxidized oils.

This point was particularly emphasized by Dr. Schwarchman in an address before this Club some few years ago, in referring to the thinning of blown oil with petroleum distillates. He cited as an example a mixture of blown oil and distillate which could be completely separated by centrifuging at as low a speed as 1,000 revolutions per minute. The addition of as little as 10% of turpentine before dilution with distillate was sufficient to cause dispersion of the oil to such an extent that separation could not be accomplished by centrifuging even at very high speed.

Apart from consideration of the solvent properties the color effect of mineral spirits when used for thinning is also an important matter. Serious darkening effects may be produced through re-action between the sulphur content of the thinner and the dissolved metallic drier content of the oil—the members are referred for further consideration of this subject to circular No. 107 of the Educational Bureau.

Reducing Costs in Varnish Making

I have already indicated that the development of formulae is a matter of the expenditure of a considerable amount of time and money. The establishment of a "standard product" represents, therefore, a substantial capital investment. One of the greatest factors influencing the maintenances of a "standard" is competition—because in order to compete in the open market a product must be standardized. Competition has, however, a great bearing upon the selling price of a commodity and in the face of keen competition the maintenance of a standard is a matter of extreme difficulty. The endeavor of every reputable manufacturer is to strictly maintain his standards, but a

commodity can be sold at a lower price legitimately only when one or more of the following conditions prevail:—

"That the cost of raw material is lower"

"That more economical methods of production enable labor and overhead charges to be reduced," or

"That lower priced raw materials may be satisfactorily introduced."

It is in this phase of the industry where the matter of cost reduction is of paramount importance that the "Scientific Worker" or "Research Chemist" is of most value, and where lie his greatest opportunities.

In the matter of depolymerisation of the fossil gums and the rendering of them soluble in the drying oils, the loss of anything from 10 to 30% of their weight would indicate rather wasteful methods of operation. Numerous methods have already been suggested and processes patented for achieving the solution of the resins in the oils without loss, but so far as I am aware, no satisfactory method has yet been developed commercially. A process patented by H. Terrisse and described by Coffignier being perhaps the most feasible.

This process depends upon the action of naphthalene and phenols which are capable of dissolving copals without loss, the operations being carried on in an autoclave under pressure of several atmospheres and at temperatures which do not exceed 575° F. Varnishes produced by this method do not, I believe, compare very favorably with those made in the open kettle.

Another question of vital importance to the industry is the finding of suitable substitutes for the rapidly depleting supplies of fossil resins. One of the most interesting developments of comparatively recent times and one which has probably had more influence than any other agent in conserving the supply of fossil resins has been the introduction of china wood oil. The peculiar properties of this oil render it of particular value to the varnish industry. The film yielded by polymerised china wood oil on application in regard to its hardness and resistance to abrasion, compares very favorably with that of linseed oil and gum varnishes and surpasses them when water-proofing qualities are desired.

Valuable varnishes can be made from china wood oil and rosin combinations, particularly those in which the so-called hardened rosins or resinates and rosin esters are used. So valuable are these combinations to the industry that the legitimization of rosin (colophony) as a varnish material has been established.

The resinates are prepared by neutralizing the rosin acids with the oxides of calcium zinc, lead, etc., and are used in large quantities as constituents of varnishes.

The tackiness of rosin films is corrected by this treatment whereby the films are hardened.

Properly prepared china wood oil and resinate varnishes will retain their gloss for years when protected from external atmospheric influences, but water affects the hydrolysis of the resinates more or less rapidly so that they are not suitable for varnishes for external uses.

Rosin esters can be obtained by the condensation of alcohols with rosin under various conditions. The ester gums are pale in color, are unacted upon by water and can easily be incorporated with oil, thereby improving the water resisting qualities of the film.

A new class of artificial resins, the "Coumarone Resins," has attracted considerable attention in recent years. These resins are polymerisatious products of cumene and indene (obtained from coal tar naphthas) by the action of condensing agents such as sulphuric acid, aluminum chloride, etc.

These resins are soluble in oils and many of the ordinary solvents and form the basis of a number of valuable varnishes. Refinements in the method of manufacture have considerably improved the materials since they were first put upon the market and they bid fair to become valuable substitutes for the fossil and semi-fossil resins.

The synthetic resins produced by the condensation of phenols and formaldehyde, whilst they find little application in the manufacture of the general types of varnish are very extensively used in the form of spirit solutions for insulating purposes. These varnishes, when baked, yield residuums of great dielectric strength, which are very resistant to the action of acids, alcohol, etc. In the solid form the resins are used for the manufacture of a great variety of moulded products.

Cellulose Ester Varnishes

Cellulose ester varnishes, known and used for many years as collodion and Banana Oils attained a new significance during the war, and may in the future develop as serious rivals to resin oil combinations. The cellulose esters which form the basis of these varnishes are obtained by nitrating cotton or other cellulose fibres in the presence of strong sulphuric acid. The cellulose nitrate is thoroughly washed to free it from acid, dried and brought into solution by treatment with various solvents, chief amongst which are the acetates of ethyl, butyl and amyl alcohols. The viscous solution thus obtained is further diluted by the addition of non-solvents such as acetone, alcohol and the coal tar naphthas, etc.

By combining cellulose nitrate with camphor in the dry condition under the influence of heat and pressure, a colorless transparent substance is obtained with which you are all familiar in the form of celluloid. This material yields varnishes which are tougher than those obtained from cellulose nitrate, and may be applied so as to build up very much thicker coats, but is very highly inflammable. The disadvantage in the use of this material is, however, that the camphor has a tendency to volatilize, leaving the cellulose nitrate in a very friable condition.

Cellulose acetate prepared by the acetylisation of cellulose was the material which principally formed the basis of the "aeroplane dopes." In addition to other valuable properties it is relatively uninflammable. I believe the cellulose esters varnishes will form the principal competitor of the gum and oil varnishes in the future.

The difficulties in the way of their more extended use at present are relatively high cost and lack of durability. They are extremely viscous, and cannot be used in anything like the same degree of concentration as the oil and gum varnishes, consequently the films produced by individual costs are extremely attenuated. The material is difficult to use when successive coats are applied; it is also characterized by poor flowing qualities. These faults will doubtless be corrected, but even at their present stage of development varnishes of this type find extensive use as lacquers for metal, and as finishes for certain classes of furniture now in vogue.

Spirit varnishes are characterized by their consisting of a solution of resin or resins in a volatile solvent, so that drying which takes place on application consists merely in the evaporation of the solvent, the resinous constituent remaining in its original state as before solution. These varnishes are very quick drying, forming hard films, which possess very high lustre, but are very brittle and lack the toughness of the oil resin varnishes. Their use generally is limited to application to surfaces not subjected to wear and tear. The cellulose ester varnishes belong to this group which also includes shellac and damar varnishes.

Time does not permit of the discussion of the properties on application or of the defects which are liable to develop after manufacture in combinations so complex and delicately constituted. Unfortunately, the exigencies of manufacturing processes and our present day lack of knowledge of the inner mechanism of the re-actions involved are such that occasional defects present themselves. Suffice it to say that many of the so-called defects of varnish during use may be traced to its application under faulty conditions.

In conclusion I would like to refer to the term "substitute." A substitute is something used in place of, or exchange for another thing, but is distinct from an adulterant, which is

something used fradulently in place of, or exchange for another thing, with the purpose of deceiving.

Many so-called substitutes have been introduced into the paint and varnish industry in order to replace standard commodities which from the nature of their origin are derived from rapidly depleting supplies.

The ultimate role of many of these substitute materials is that they become established as legitimate raw materials by virtue of distinctive properties which they possess which render them valuable for particular purposes.

The investig ation of new sources of supply, the determination of the particu lar properties of new materials and the uses for which they are best adapted offers an unlimited field for the exploit of the research worker.

His efforts in this direction should be well rewarded, and by realizing this aim the conservation of the present supply of raw materials and particularly of the resins is assured.

DEVELOPMENTS IN USE OF BLEACHING AGENTS

At a meeting of the Liverpool Section of the Society of Chemical Industry, held October 27th, an interesting address was given by W. M. Inman, M.Sc., A.I.C. on "Developments in the use of Bleaching Agents for Textiles and Paper Pulp." A considerable portion of the address referred to the use of liquid chlorine as a means of securing bleach liquor as compared with liquors from dry bleaching powder. In the case of liquid chlorine, the bleachin g liquor contains less lime sludge, and therefore settles more quickly. Strong bleach liquors can be prepared and diluted as required for use, hence a comparatively small plant has a large output. The reduced quantity of sludge to be disposed of means more efficient washing and therefore less available chlorine goes to the refuse taps. Also the cost of sludge disposal is reduced in proportion as the sludge is reduced.

Referring to the use of liquid chlorine in British plants, it was pointed out that liquid chlorine has not as yet come into such general use as in America.

However, with apparatus such as exists in present-day British paper mills and bleach fields it is possible to chlorinate milk of lime and produce bleach liquors direct. A rapid agitation is necessary and a fairly deep mixing tank is desirable.

Details of such a run are as follows:—The mill at which the trial was made uses bleach liquor at 5½° Tw., that is about 17.1 g. per 1. of available Cl. 264 lb. of poor lime (85.6% CaO) and 237 lb. of liquid chlorine were used. The total quantity of bleach liquor at 5½° Tw. obtained was 211.5 cubic feet, and it contained 231.0 lb. of available chlorine. The yield of available chlorine on the total chlorine absorbed is therefore 97.4%. This compares very favorably with the efficiency of most bleaching mixing plants. Using bleaching powder it is somewhat difficult to get even a 95% efficiency of extraction; in fact, so high a figure is probably rare.

There is one other method of using liquid chlorine to advantage in the production of bleach liquor, and it is this last method which at the moment will probably find most favor in the eyes of paper makers and bleachers. It consists simply in chlorinating the free lime present in all bleaching powders, during the agitation of the bleaching powder with water to make bleach liquor. This process can be undertaken with ease in the usual type of bleach mixer. All the extra apparatus required consists of one or two dip pipes leading down to the bottom of the mixer, to which the chlorine cylinders can be connected. If the agitation of the mixer is very rapid, having a peripheral speed of 500 feet per minute or thereabouts, the chlorine can be introduced into the bleach batch as liquid and allowed to vaporise in the mixing tank. This allows the cylinders to be emptied rapidly, and it is possible, given a suitably deep tank and rapid agitation, to introduce the necessary quantity of chlorine in 20 to 25 minutes. When agitation is slow it is advisable to bubble chlorine gas into the liquor. This is done by using cylinders having no internal siphon pipe, which, therefore, deliver gas. This slows the process down somewhat, but is not a serious obstacle to success. It has been found by experiment that average bleaching powder, containing 35 to 37% of available chlorine, can absorb by this process about one-tenth of its weight of extra chlorine. The residual sludge is, of course, considerably reduced, sometimes to as little as one-fourth of its normal bulk. The original sludge consists chiefly of free lime, and this has gone into solution to form hypochlorite.

In summing up the developments in the use of bleaching agents, Mr. Inman said that it would appear that the advent of liquid chlorine as an everyday article of commerce will mark a new era in bleaching practice. Liquid chlorine is a comparatively new product in England, and is only beginning to make its presence felt. It would be a bold statement to say that it is going to place bleaching powder among the obsolete chemicals either in England or in America, but there can be no doubt that it is going to find extensive application either as an adjunct to bleaching powder or in special cases as a substitute for it. Bleach liquors will be made by the consumer. We are reverting to the position of over 100 years ago—with one difference, viz., liquid chlorine instead of chlorine gas.

During the discussion that followed a question was raised as to the effect of the use of liquid chlorine in leaving behind enough traces of chlorine in the pulp to injure the dandy roll on the paper making machine. To this Mr. Inman replied that in order to have any really serious effects a very much larger surplus of bleaching liquor would have to be left behind in the pulp than would be ever likely under ordinary regulation.

TOP SIZING PAPER WITH RUBBER LATEX AND CASEIN

With Rubber Milk in barrel and tank lots threatening to some extent to take the place of crude rubber as now sold, it is interesting to note new uses and methods coming up in some industries. Work is being done in paper and textile fields. In our last issue the Kaye Method of direct addition to the beater was mentioned. More recently F. R. Henderson & Co., of 111 Broadway, New York, have developed a top sizing method which is a simple immersing of the paper in a mixture of Latex and Casein, and then running it between rolls to insure even distribution, and to squeeze out excess liquid. This Latex Casein mixture consists of 75% Latex and 25% Casein, calculated on a basis of dry rubber and Casein, diluted with an equal volume of water. This process may be used for making paper for wrapping, insulating, oil, and water resistant purposes.

Some experiments on Kraft paper indicated that the bursting and tearing strengths may be considerably increased. An untreated 45-pound Kraft paper with a bursting strength of 45, a tearing strength of 10 with the grain and 10½ against, when coated with Latex Casein increased to 77½ bursting and 13 and 35 tearing. It is calculated that 5% added weight would cost 1.9 cents per pound of paper and 2% added weight 4/5 cents per pound.

AMMONIUM SULPHATE AS A WEED-KILLER

Charlock and other weeds in corn fields are usually destroyed by spraying with a 3 or 4 per cent. solution of copper sulphate. This substance however, has the disadvantage of being poisonous and of checking the growth of the crop, which may thus need subsequent stimulation with a nitrogenous fertiliser. Efforts have therefore been made to discover a substitute, and as the result of experiments (described in the Journal of the Ministry of Agriculture, London, March, 1922), carried out last year in various centres, it has been found that solutions of ammonium sulphate not only kill the weeds, but stimulate the crop as well. A solution consisting of 2 cwt. of ammonium sulphate dissolved in water and made up to 60 gallons was found to destroy a wider range of weeds than copper sulphate, but was not as safe to use with pea, bean, vetch and potato crops.

Chemical Society News

Containing Official Announcements of the Canadian Institute of Chemistry.

THE WORK OF THE INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

In order that members of the Canadian Institute of Chemistry may know something of the work going on in this connection, and the part Canada is playing, through the Canadian Institute of Chemistry, the following letter from Sir William Pope is printed in full:—

Union Internationale de la Chimie Pure et Applique.

Paris, December 10th, 1922

Sir William Pope, President of the Union Internationale de la Chimie Pure et Appliquee, Professor of Chemistry at the University of Cambridge.

To the President of the Canadian Institute of Chemistry,
57 Queen Street West, Toronto.

Mr. President and Dear Colleague,

You will soon receive, under separate cover, the full report of the Third International Conference of Chemistry.

I beg to call your attention to the resolutions adopted at our last session, and to ask you to kindly, inasmuch as your country is concerned, help in the realization of the wishes expressed.

Reform of the Nomenclature of Inorganic Chemistry:—

In these proceedings, you will find a complete report by Professor Delepine on the results obtained from the beginning of the discussions on the reform of the nomenclature of inorganic chemistry. It was agreed that the delegates of each country to the International Commission should forward to our General Secretary the text of the different propositions they would have to offer. We would therefore be very glad to receive the suggestions of the specialists of your country.

Reform of the Nomenclature of Organic Chemistry:—

The committee formed by the three editors of the most important periodicals of Organic Chemistry: Messrs. E. J. Crane, Greenway and Marquis, will prepare a systematic report whose main lines could be adopted by all the leading scientific and technical publications and by the authors of treatises and dictionaries on Chemistry.

As soon as our General Secretary receives this work, he will submit it to the National Committees appointed in 1921.

Reform of the Nomenclature of Biological Chemistry:—

The paper presented by Professor Gabriel Bertrand is published in the Report of the Conference of Lyon. I would be very grateful, if, in accordance with the resolutions adopted, you would endeavor to have the propositions studied in detail in your country, so that a decision may be reached at our next conference.

Revision of the Electrode-Potential Signs:—

The Lyon Conference came to two important conclusions on this question. 1st, When the potential of a metal in solution is mentioned, the sign of the metal's potential should be employed. 2nd, When a numerical value of a potential is given, the basis of reference should be indicated with all necessary details, for reproducing.

I would be very grateful if you would bring this to the attention of all concerned, and work to secure its application by the authors of books, articles and papers to be published in your country.

Documentation:—

In addition to the requests made by the representatives of the chemical journals, assembled at Lyon, it was decided to form a permanent International Commission, in which Commission each country would be represented by one delegate.

Bureau of Physico-Chemical Standards:—

The list of the delegates appointed by the various countries to the Bureau of Physico-Chemical Standards is not yet complete and I urgently beg the nations who have not yet made their designation to do so at once.

Pure Chemicals for Research:—

It was decided that the delegates of each country to this Commission will compile all the documents concerning this question, which the Commission is studying, and secure the opinion of the competent authorities in his country. I would ask you to forward to our General Secretary all useful information in this matter, particularly the Codex which have or which will be published in your country.

Documentation on Industrial and Technological Products:—

If a list of the different manufacturers engaged in chemical industry, has been published in your country, specifying what they really manufacture, I beg you to kindly forward same to the General Secretary.

If this list has not yet been published, you would be very kind if you could advise our Secretary where he can secure the information.

Adoption of a Thermochemical Standard:—

1. Benzoic acid is adopted as thermal standard to standardize the thermal capacity of calorimetric apparatus used to determine the heat of combustion of organic compounds and combustibles.

2. The benzoic acid used for standardization is supplied by the Bureau of the International Institute of Physico-Chemical Standards, (Brussels, Universite, rue des Sols): it is also prepared by the Bureau of Standards of Washington.

3. Provisionally, a value of 6324 cal. 15°, has been adopted for the heat of combustion of one gram of benzoic acid, weighed in the air. This corresponds to 6319 cal. 15° per gram (vacuum).

4. It is to be recommended to authors who publish data concerning the heat of combustion of organic substances or combustibles, that they indicate always the value they have adopted for the heat of combustion of the benzoic acid which has been used to standardize the calorimetric apparatus.

The Commission desires that the value of the mechanical equivalent of heat shall be gauged with such precision that the heats of combustion of organic substances or combustibles may be expressed in absolute units.

I have the honor to ask you to communicate these resolutions to all competent authorities of your country, so that they may serve as basis for all works published in the future.

Tables of Constants:—

The Ministry of Foreign Affairs of France has communicated to the various governments the resolutions adopted by the Council of the Union, concerning the creation of an International Fund.

The Study of Combustibles:—

The Conference of Lyon asks that each affiliated country compile a list of various combustibles, with their characteristics.

I would be very much obliged if you could assemble all the documentation pertaining to your country, and forward same to our General Secretary.

The Study of Ceramic Products:—

The Bureau of the Union asks you to promote the study of the suggestions presented at the conference of Lyon by Mr. Washburn.

Conservation of Foods:—

It was decided to ask each affiliated nation to kindly have a summary prepared of all works produced in its territory, concerning the use of all the processes of conservation of solid and liquid foods.

As soon as this summary is ready, I would ask you to forward it to our General Secretary.

International Patent:—

The Commission asks that an inquiry be made in each country with regard to the suggestions made in the report of Mr. Paul Kestner.

I ask you to kindly diffuse this report and send to our General Secretary your suggestions.

Industrial Hygiene:—

The Conference has decided to place on the program of the next meeting of the Union the study of the industrial fumes problem, and also of the absorption and recovery of toxic gases and vapors.

I would be grateful if you would ask the delegate of your country to kindly summarize in a report all the works undertaken in your country in this connection.

Financial Situation of the Union:—

At the end of the year, you will receive the accounts for 1922 with the budget proposed for 1923.

This letter will show you that the Union is faced with a heavy task.

Our Bureau will succeed only inasmuch as it receives the full co-operation of the affiliated countries. It hopes that you will grant us your hearty support.

Believe me, Mr. President and dear colleague,

Yours most sincerely,

(Signed) W. J. POPE.

Appointments to the Union have been made from Canada as follows:—

Committee on Inorganic Nomenclature, Dr. C. A. Neish.

Committee on Organic Nomenclature, Dr. G. Stafford Whitby.

Committee on Biological Nomenclature, Dr. Clara Benson.

Committee on Solid Fuels, R. E. Gilmore.

Committee on Liquid and Gaseous Fuels, B. Collitt.

Committee on Ceramics, J. Watson Bain.

Committee on Patents, A. E. MacRae.

Committee on Industrial Hygiene, Dr. Georges H. Baril.

Committee on Tables of Constants, Dr. W. Lash Miller.

Committee on Documentation, Dr. Georges Baril.

Committee on Chemical Manufactures and Statistics, S. J. Cook.

Committee on Food Conservation and Legislation, Dr. A. T. Charron.

These are Chairmen who will look to others throughout Canada for direct assistance in their work. From this start, it is hoped to build up active Committees.

OTTAWA SECTION, S.C.I. HEARS ABLE ADDRESS ON BIOCHEMISTRY IN RELATION TO NUTRITION OF SILVER BLACK FOX

The regular monthly meeting of the Ottawa Section, Society of Chemical Industry, was held at the University Club, February 7th, Mr. F. J. Hambly presided.

Letters from the following were read: Mrs. Waddell, expressing appreciation of the Society's reference to her husband's death. Mr. Burton announcing the Annual Meeting of the Canadian Sections in Toronto, from May 25th to 31st, inclusive.

The chairman asked for references to current literature and Dr. Macintyre gave a very interesting outline of the discovery of the new element "Hafnium," by Professors, Coster and Hevesy, as announced in "Nature" of January 20th, and by Dr. Scott at a meeting of the London Chemical Society. He showed the association of the new element with the titanium zirconium group and suggested that it would be very interesting to Canadians from a scientific view-point if the black titaniferous sands of the lower St. Lawrence near the Moisie River contained this new element in an appreciable percentage.

In announcing the subject of the evenings' discussion, Mr. Hambly showed that much of the recent activities in chemical research have to do directly with life problems. He referred to the joint meeting in London in January of the London Section S.C.I. and the Bio-Chemical Society. At this meeting Dr. H. E. Armstrong said that rather than found an Institute for the study of micro-organisms, they required an institute which would make the chemist of the country of some importance. in the eyes of the public. In referring to a review of Dr. MacCallum's book on the Newer Knowledge of Nutrition he said that some of the most interesting parts of the book are devoted to the thesis that various states of illness, both mental and physical are to be attributed to faulty diet and not to disease.

Mr. G. Ennis Smith, Bio-Chemist of the Government Research Laboratory, Hull, then gave an interesting and instructive talk on Bio-chemistry in relation to the rearing and nutrition of the silver black fox. He spoke of the difficulties and problems that were harassing the fox industry and urged the necessity of careful attention to feeding, particularly during the time of breeding. The most favorable results were obtained by feeding a maintenance ration during this period. Over-feeding caused the arrest of the development of the young pups.

An interesting discussion followed in which Dr. Shutt, Mr. Hambly, Dr. Macintyre, Mr. Ellsworth and Mr. Hossack took part.

Mr. J. H. Harris, M.P., East York, referred to his long association with the Society of Chemical Industry and expressed his pleasure at being present at the meeting to hear Mr. Smith with whom he graduated from Toronto University. He urged the necessity for putting before the public the results of Chemical activities in a greater measure than is now done.

Mr. Hambly extended the thanks of the Section to Mr. Smith for the instructive address.

A. E. MACRAE, Honorary Secretary.

MANITOBA CHEMICAL SOCIETY

On January 27th, the Manitoba Chemical Society held its monthly meeting at the University and the members had the pleasure of hearing a paper by Professor Bletcher, of the Department of Pharmacy, University of Manitoba, on "Opium." Twenty-two members were present.

At the commencement, Prof. Bletcher gave an historical outline of the vegetable drugs and mineral compounds which are used as medicines. He then treated Opium historically outlining the principal localities, Asia Minor, India, Persia, China, etc., in which it was produced, and described minutely the care that was needed and the character of the soil that was required, climatic conditions, moisture, etc. that was essential in insuring a good yield. The matter of incising the green capsules was next described, illustrating the different methods that were used in different localities. The capsules are some $1\frac{1}{2}$" in diameter and are incised transversely or longitudinally by means of a knife. This requires great skill, as the incision must be made to the proper depth. By the next day the exuded juice has hardened and is scraped off with a knife and then made into lumps of the proper size. In the scraping off process, there is a good chance of adulteration and this was practised to a considerable extent in the early days. Then all shipments had to be tested by a public examiner who made physical tests on it. Now Opium is tested for morphine content and is sold accordingly.

An important addition to the profits of the opium culture is the sale of the poppy seeds from which the oil is expressed and is used for a variety of purposes. The seeds contain about forty per cent. of oil.

Prof. Bletcher then described some of the more important alkaloids, acids, neutral substances, etc. which are found in opium, (morphine being the most important) and showed how the percentage varied with the locality. Indian opium containing much less morphine than that produced in Asia Minor.

Morphine 4.0..... 18.0%

Codeine 0.3..... 1.9%

also present meconic acid, resins, gums, etc.

The physiological action of opium was then discussed, and it is without doubt one of the most important remedies available for use in medicine. Opium smoking was then described, and the method of treating the opium for this purpose was explained. It is noteworthy that the opium most highly prized for smoking contains a small percentage of morphine.

Prof. Bletcher concluded his lecture by showing some qualitative tests for a true alkaloid, such as ammonium hydroxide, tannic acid, Mayer's reagent, etc. and afterwards showed some slides of the cultivation, incising, packing, etc. of the opium industry.

W. A. Davidson,
Secretary.

WINS ESSAY AWARD OF MONTREAL SECTION S.C.I.

Mr. William Cauldwell Munro, fourth year student in Chemical Engineering at McGill University, has been awarded the prize donated by the Montreal Section, Society of Chemical Industry, for the best essay embodying experience in summer work. The subject of Mr. Munro's essay was "The Production of Pulp and Paper."

Wm. C. Munro

Last October the Montreal Section offered a cash prize of $50.00 to the student of McGill University entering his fourth year in the Chemical Engineering Course, who, in the judgment of a specially appointed Committee, would submit the best essay setting forth his experience in summer work. The main condition of this bursary was that, the essay be essentially of a practical nature and should reflect not only the record of experience of the candidate, but also his ability to put his observations in the logical form of an essay. The examining committee, consisting of Mr. H. W. Matheson, Dr. J. T. Donald, and Mr. R. Job, after reviewing the submitted essays had no hesitation in awarding the prize to Mr. Munro, and the award was announced by Mr. Matheson, chairman, at the meeting of the Montreal Section, Monday evening, February 19th. In the opinion of the committee Mr. Munro's essay was not only presented in concise and neat form, but also showed a comprehensive and detailed knowledge of the operative of pulp and paper mills.

Mr. Munro was born in Toronto, receiving his education at the Queen Victoria School and Parkdale Collegiate, later completing his course at Westmount High School, Westmount, Que. During the summer of 1919 he spent the greater part of vacation working under Dr. J. S. Bates, at the mill of Price Bros., at Kenogami, and during the summers of 1920-1921-22, he was with the Ontario Paper Co., at Thorold, Ont. It is interesting to note that Mr. Munro has had mill practice as well as laboratory work, as he joined the Paper Makers' Union and worked through the various stages of mill operation.

Mr. Munro is now completing his fourth year in Chemical Engineering at McGill University and the award is a very popular one, both among the members of the Society and his fellow students.

GENERAL DESIGN AND LAYOUT OF CHEMICAL PLANTS

The first of the six illustrated lectures given by Mr. Francis M. Turner, Jr., at the University of Toronto on "Chemical Plant Equipment," during the last week of February, took place at Hart House, Monday evening, February 26th, before a large gathering of members of the Society of Chemical Industry, Canadian Institute of Chemistry and Students in Chemistry at the University. The lectures, arranged by the University in co-operation with these societies were a splendid additional short course for students and graduates.

The subject of the first lecture was "General Design and Layout of Plants." In introducing Mr. Turner, the chairman, Mr. L. E. Westman, referred chiefly to the work Mr. Turner accomplished since graduating from the University of Toronto, particularly as Technical Editor of The Chemical Engineering catalog, the well-known engineering annual, and as consultant chemist and sales engineer.

There were five essential features of a chemical plant: Physical, chemical, mechanical, economic and practical. Under physical were included such things as proper size of equipment, etc.; Chemical—the working of the process itself; Mechanical—the proper fitting together of equipment, etc.; Economic—the cost of the operation; Practical—the including in the machinery or equipment of such features as will make the operation really practical, thus doing away with objectional conditions that workmen might with good reason refuse to work under. Examples of lack of proper attention to these five features were given by Mr. Turner. Continuing the matter of the location of plants was discussed at some length.

The factors determining the location of a chemical plant were: First, the convenience to sources of raw material; second, the markets, many plants were found located near, or at the market for the product, regardless of the source of raw material, such as the vanadium works at Pittsburgh, where the ore was brought many thousands of miles, and then processed at Pittsburgh for sale to the steel works there; third, the availability of natural power—examples being the electro chemical works, at Shawinigan Falls, and Niagara Falls. Other factors determining location of plant were: The disposal of effluents, labor, climate, and personal preference on the part of the owners.

The matter of the proper handling of materials was then briefly dealt with (this was further dealt with, in detail at Lecture II.) following which fire prevention and safety schemes were pointed out and emphasized by the speaker. In his concluding remarks, Mr. Turner outlined the various types of plant laboratories—Testing and Control; Process Research—where work of a research nature was being done on the particular processes of the plant, but no research in matters outside of those directly bearing on these processes; Pure Research—where research was prosecuted along various lines, such as the laboratories of the Westinghouse, and General Electric Companies; Experimental Plant Laboratory—where the operations of the plant are conducted on a small scale, but similar to the larger

operations "out in the plant"; The laboratories of consulting chemists; and finally "Library Research." In concluding, Mr. Turner emphasized particularly the great need for more "library research" or the reading of literature. Before any work was undertaken the literature on the subject should be thoroughly investigated.

The address was illustrated by some extremely well chosen views of chemical plants and equipment, and in this connection the chairman announced that Mr. Turner had kindly donated these slides to the University of Toronto.

Expressions of appreciation of the address were made by Dr. Lash Miller, Professor J. W. Bain, and Mr. M. L. Davies. The students present at the dinner were the guests of Mr. A. Neighorn.

MEETING OF MANITOBA MEMBERS OF THE CANADIAN INSTITUTE OF CHEMISTRY

On February 20th, Professor M. A. Parker, as resident member of Council, called a meeting of local members to discuss Institute activities. Advantage was taken of the presence of Dr. T. Thorvaldson, representing Saskatchewan. A. W. Alcock acted as Secretary.

As a result of the expression of opinion of those present, the following resolutions were passed:—

1. "This meeting of the majority of the Manitoba members of the Institute, with Dr. Thorvaldson, believing that the primary aim of the Institute should be the elevation of the professional status of its Fellows and Associates, and that this can only be accomplished if membership in the Institute becomes fully recognized as the highest Canadian qualification in Chemistry, therefore considers that it would be a very unwise proceeding to allow the admission of unqualified persons, other than students, to any class of membership."

2. "That this meeting is opposed to the recommendation that student members should automatically advance to Associateship upon graduation in Science. It believes that such persons should make application and that these applications should be individually considered, and further that no one should be admitted to the Associateship until he has reached the age of twenty-one."

Arrangements were made for informal gatherings of the Manitoba members from time to time.

TORONTO SECTION, S.C.I., HOLDS SMOKER.

On Thursday evening, March 8th, a "Giant Smoker" was held by the Toronto Section, Society of Chemical Industry at Hart House. That science professors, chemists, and technical men generally are not immune to "a bit of fun" occasionally was amply proved by the way in which everyone appeared to enjoy the "high class" three act "tragedy" staged by members of the 4th year class in Chemical Engineering. The "play" was produced under the "personal supervision" of Mr. Victor van der Linde with Mr. G. N. Hill as "Master Electrician." A "paper" presented by Professor J. Watson Bain gave a humorous account of the way one boot polish manufacturer had built up a successful business. Those who doubted the historical data in connection with this paper were at once convinced of its absolute veracity when it was stated that the manufacturer upon reaching an annual personal stipend of $150,000 had "generously" advanced his chemist's salary to the magnificent total of $2,500 per annum. This was too true to life; all doubt as to the authenticity of the other parts of the narrative quickly vanished. Songs by Professor J. T. Burt-Gerrans were particularly enjoyable. The serving of refreshments brought the happy evening to a close.

It was regretted that Mr. W. Schorman, chairman of the Smoker Committee, and who had done a great deal of preparatory work for the affair, was unable to be present, having been called out of town.

PERSONAL

Mr. B. D. S. Millidge, formerly Technical Superintendent with Brompton Pulp and Paper Co., Ltd., has taken a position as chemist with the Howard Smith Paper Mills Ltd. He will be located at Cornwall, Ont.

Mr. A. H. Maude, formerly of the research department, Canadian Electro Products Co., Shawinigan Falls, Que., is now with the research department of the Westinghouse Electric Manufacturing Co., Pittsburgh, Pa.

Mr. Cyril H. Crowe has taken a position as chemist in charge of the laboratories of the Canadian General Electric Company at Peterboro, Ont.

New Books Reviewed

"PLASTICS AND MOLDED ELECTRICAL INSULATION"

By Emile Hemming. Chemical Catalog Co., New York. 313 Pages. Price $5.00

The book gives a broad survey of a general field that has sprung into prominence with increasing speed during the past ten years. The general principle of working up a product while in the plastic condition, and then hardening it, is one that is used in a great variety of industries and may be applied to a great many different types of materials.

The author first deals with ceramic products, cements, glass, casein products and road construction. Here some slight reference is given to practically all commercial products, with an outline of their manufacture. Under a chapter called "Sundry Patent References" will be found references to a very great number of special industrial products. The distinct feature of the work is the very complete set of patent references following every chapter.

The second portion deals with hot and cold molded organic compositions, rubber compounds, celluloid, their manufacture and specific characteristics. Here again, patent references are well detailed. The book covers a very wide field, and has perhaps been trimmed down rather unduly in its treatment of some topics.

Its principal merit for most readers will lie in its treatment of modern methods of producing and testing various plastics of a general organic nature. These chapters are well illustrated and the author has made excellent use of his space in the wide field attempted.

"Dictionary of Applied Chemistry," Vol. III.

By Sir Edward Thorpe. Longmans, Green Co., London and Toronto. Price $20.00

Such a well-known work of reference needs hardly more than announcement. This new edition, Third Volume, contains very complete summaries of subjects from explosives to ketones. Such handy and complete tools should very properly become the basis of plant libraries, and it is to be regretted that many Canadian chemists continue to work along with very meagre book assistance. Such conditions make an investigation of even the simplest kind almost impossible. It should be the ambition of more chemical libraries to have such works as this.

"Industrial Hygiene and Medicine"

By E. W. Hope, W. Hanna and C. V. Stallybrass. Bailliere, Tindall & Cox, London. 776 pages. Price 25s.

This is, without doubt, a work of exceptional value, and a real contribution to the field it covers.

The development of the science of guarding working conditions is complete for every industry, and the whole subject is treated in a clear, logical and scientific manner. Data has been secured

and interpreted in the light of modern industrial engineering practice and medical research combined.

Besides complete surveys of vital statistics and general hygienic considerations, there are excellent chapters on industrial poisoning; dust as a cause of disease; industrial infections; occupational affections of the skin and special senses; industrial physiology; industrial welfare and the specific handling of accidents of all kinds. The chapter on Miscellaneous Occupations in relation to health covers much of special interest in the chemical and allied field. Mining, iron and steel, textile, compressed air, and a variety of chemical industries are discussed from the industrial hygiene standpoint. This book has a place in every factory and plant, and we recommend it without reservation as a most timely and valuable contribution.

ALCOHOL REGULATIONS AND NOMENCLATURE

Simple as these may seem to many chemists, it appears that a great many users of Industrial Alcohol do not understand or distinguish the meanings of terms used. If chemists made more of a point of explaining regulations and terms to the public and to business executives who are industrial alcohol buyers, the unreasonableness of some regulations and the necessity for others might become more apparent. With the idea in mind of telling over again the principal facts regarding alcohol regulations in force at the present time, the following statements are made:—

It should be the business of industrial users of Alcohol to guard their privileges in such a way that absolutely no misuse can be made of the product. In this way, the general tendency should be to widen the number of denaturants and lower the tax to an ideal point where all legitimate industries may have alcohol at a price in Canada which bears a much closer relation to the cost of production than is the case in many instances at present.

The Dominion Government controls Industrial Alcohol distribution. Alcohol, methylated or denatured, is the only way the Government can protect a revenue it desires to secure and make non-potable an industrial commodity.

At the present time there are three completely denatured and seven specially denatured formulae for sale which have been approved by the Department of Customs and Excise. The former can be used, without restriction, for any purpose, and the latter can be used, under permit only, in the manufacture of certain products.

There have been no formulae authorized as yet for use in the manufacture of some products, the chief of which are: pharmaceutical preparations; proprietary medicines; extracts; essences; perfumes; ether; chloroform; collodion, tooth pastes, etc. It is, therefore, still necessary for the manufacturer to use pure ethyl alcohol in the production of such articles, under special license issued by the Government.

Various rates of Excise Taxes are imposed on the pure ethyl alcohol, when used in manufacturing the above products. These range from 15c. per proof gallon to $2.40 per proof gallon.

Methyl Alcohol

Methyl or wood alcohol is one of the products formed when hardwood is placed in a retort and distilled. The liquid which comes off is refined into various products, including acetate of lime, acetone, methyl acetate and wood alcohol.

The properties of wood alcohol differ entirely from Ethyl Alcohol. In general, it is extremely poisonous when taken internally, and has been the cause of death in many cases where workmen or others have, through ignorance, consumed it. Its harmful properties remain even when diluted with other alcohols. In milder cases of poisoning through wood alcohol, blindness results, and skin troubles arise.

Methyl or wood alcohol should not be confused with Methylated Spirits or Denatured Alcohol. The base of these two latter substances is pure Ethyl Alcohol, and the percentage of pure Ethyl Alcohol in formulae for Methylated Spirits and Denatured Alcohol may run as high as 97½%.

Methylated Spirits and Denatured Alcohol

Methylated Spirits and Denatured Alcohol are nothing more than pure Ethyl Alcohol made poisonous utterly unfit for use as a beverage or an internal medicine, in order that it may be placed freely in the hands of workmen using it in arts and industries as a solvent or precipitant. In this form, it may be used generally for burning purposes, and as an anti-freeze solution for automobile radiators.

The process of methylating and denaturing is carried on under the supervision of Government officers, and the ingredients which are added to the pure ethyl alcohol, to meet Government requirements, are known as denaturants, and are always carefully chosen so as not to interfere with the efficiency of the pure ethyl alcohol.

Prior to July, 1920, the sale of Methylated Spirits or Denatured Alcohol was carried on entirely by the Department of Customs and Excise, then known as the Department of Inland Revenue.

The name "Methylated Spirits" was adopted by the Department to distinguish the alcohol it sold from other alcohols on the market. The name also signified that Methyl Alcohol or Wood Alcohol was the only denaturant used by the Government to poison and make non-potable the pure Ethyl Alcohol. The product then sold was simply a solution of pure Ethyl Alcohol containing certain percentages of Methyl or Wood Alcohol, the result being the well-known Methylated Spirits.

In July, 1920, Parliament passed Bill No. 178, amending the Inland Revenue Act, which took the sale of Methylated Spirits out of the hands of the Department of Inland Revenue and turned it over to the distillers. This was done in order that the development of the industries of Canada would not be retarded and making it easier for the manufacturers to secure ample quantities of Methylated Spirits or Denatured Alcohol.

Thus the distribution of these products was revolutionized and put on a more sound basis, as the distillers were in a better position to carry on this work of methylating and denaturing than was the Department.

New Denaturants are Helping Manufacturers

An advance move in the matter of denaturants was also undertaken. During the period that the Department of Inland Revenue carried on the denaturing of alcohol, there were only four formulae available. Since that time several other formulae have been approved, and it is anticipated that during future years, many more will be authorized and available.

The idea that Wood Alcohol only was suitable as a denaturant has become obsolete (many other chemicals now being used), and with it the general use of the word "Methylated." A better term by far is "denatured." In fact, the Government in issuing its regulations to the distillers as to how and under what conditions pure Ethyl Alcohol should be denatured and sold, deemed it advisable to do away with the name "Methylated Spirits" and adopt only the name "Denatured Alcohol."

Alcohol producers decided that it would be advisable to retain this name for those grades of Denatured Alcohol in which Wood Alcohol or Methyl Alcohol was used as a denaturant. In this way, the name "Denatured Alcohol" has been reserved for those grades or formulae in which chemicals other than Wood Alcohol have been used as denaturants.

CHEMIST WANTED FOR MINES BRANCH.

An assistant chemist is required for the Fuel Testing Division, Department of Mines, Ottawa. Initial salary $2,100, increasing for efficient service at rate of $120 per annum until a maximum of $2,580 is attained. Education equivalent to graduation from a university; at least three years of post-graduate laboratory experience. Application forms must be filed not later than March 29, 1923, at office of Civil Service Commission, Ottawa.

Preliminary Report, Mineral Production of Canada, 1922

Increase of Over 31 Per Cent. in Gold Production, and 30 Per Cent. in Silver

By S. J. Cook, Chief of the Mining, Metallurgical and Chemical Branch, Dominion Bureau of Statistics

THE value of the mineral production of Canada in 1922 amounted to $183,029,595, as compared with $171,923,342 in 1921. The year's output was made up of: Metallics, $61,144,990; Non-Metallics, $82,582,339; Structural Materials and Clay Products, $39,302,266.

In comparison with preceding years, the mineral production of Canada in 1922 was very creditable and was only exceeded in value by the records established in 1918, of $211,301,000, and in 1920, when the peak of $227,859,000 was reached.

The outstanding feature of the metal production was the excellent gain made in the output of gold by the two important producing provinces, Ontario and British Columbia. The total gold production for Canada during the year amounted to more than 1,230,000 ounces and compared with the 1921 output showed an increase of 31.0 per cent. The increased prices and the lively markets for silver and lead were reflected in excellent gains.

Silver advanced 30% in quantity and 40% in value while lead showed an even wider spread between quantity and value percentages, production rising 41% and the value increasing more than 77% over the record for the previous year.

Nickel and copper were lower than in 1921, although the advance in the price of copper checked the decline in value to 2.6% as compared with a 9% decrease in quantity. Nickel fell off about 9% in both quantity and value. Although the smelter production of blister and converted copper in British Columbia was less than in 1921 the recovery and rise in the price of copper did not occur until about the middle of the year, and some important copper mines which were active in 1921 did not appear on the shipping list until nearly the close of the year when there was a desired improvement in the copper industry. The inactivity of the smelting departments of the International Nickel Company in the earlier part of the year and of the British America Nickel Corporation throughout the entire year accounted for the small production of nickel.

Large Increases in Zinc and Cobalt Production

The increase in the output of zinc was further emphasized by the rise in price of this metal to an average of 5.716 cents per pound for the year, as compared with 4.655 cents in 1921, both quotations from the St. Louis market. The 6 per cent. increase in quantity resulted in a 30 per cent. advance in the total value reported.

The year-end saw a marked revival in the production of cobalt and more than 443,000 pounds valued at $1,442,000 was produced. Compared with 1921 data, these figures showed 76% greater quantity and nearly 91% increase in value.

Metals as a whole advanced 23.9 per cent. to a total value of $61,144,990 as compared with $49,343,232 in 1921.

Among the non-metallics the output of coal considering the great loss of time through strikes was most encouraging.

Great Loss of Time Through Coal Strikes

The output of coal from Canadian mines during twelve months of the calendar year 1922, was approximately 15,000,000 tons at an estimated value of $66,486,025, compared with 15,057,493 tons, valued at $72,451,656 in 1921; 16,946,764 tons, valued at $82,496,538 in 1920; and 14,919,096 tons, valued at $55,622,670 in 1919. The great strike which tied up the United States coal mines for several months was reflected in Canada, and resulted in a loss of 1,222,288 working days. Fifteen disputes occurred between employees and employers in the coal mining industry in Canada during the year ending December, thirteen of which were in Alberta and south-eastern British Columbia, and the other two in Nova Scotia. In all 25,251 men were affected, and of the time lost, 931,960 days were lost in the strike which began on April 1st, and 290,328 day's time were lost in the short strikes originating later in the year. Having in mind the fact that over one million working days' time was lost by the employees of the coal mining industry during the year, the output of fifteen million tons may be considered quite satisfactory.

Alberta coal mine output amounted to 5,959,000 tons, a little more than half of which was lignite and nearly all the balance bituminous. Nova Scotia contributed 5,558,000 tons and occupied second place among the coal-producing provinces. British Columbia accounted for 2,927,000 tons, and Saskatchewan and New Brunswick followed with 302,000 tons and 297,000 tons respectively.

The output of natural gas from Canadian fields in 1922 amounted to about 14,954,097 thousand cubic feet, valued at $5,468,963. The quantity of gas produced was practically unchanged from the output in the preceding year, but the value in 1922 was approximately $874,799 more.

Ontario retained the premier position and produced 7,800,000 thousand cubic feet while Alberta followed with an output of 6,500,000 thousand cubic feet. Albout 753,898 thousand cubic feet was produced from the fields of New Brunswick.

Asbestos and Feldspar Production

Asbestos mining in Quebec in common with the other asbestos producing countries of the world, suffered a decline in 1921 which continued throughout the first half of 1922. Towards the close of the year there has been a considerable revival in this industry and prospects were much better than at any time previously within the past two years. The reduction in the percentage of royalty taxes imposed by the Provincial Government on all asbestos produced and sold will undoubtedly prove quite a stimulus to the industry as a whole. The manufacture of finished asbestos products is being looked forward to as a coming important industry in the Province of Quebec. Two plants are presently supplying the local demand for asbestos papers, shingles and brake linings, but it has recently been announced that other companies will shortly enter this field.

The output of asbestos in 1922 reached a total of approximately 136,657 tons of all grades, valued at $4,664,106 as compared with 92,761 tons valued at $4,906,230 in 1921. The appreciable percentage increase in production was due almost entirely to the activity about the mines during the closing months of the year.

Feldspar mining in the Province of Quebec has been growing apace during the last two years. The industry which is an old one in the province was given a great impetus by the discovery of a large body of cream white orthoclase feldspar in Derry Township in the fall of 1920.

The output of gypsum also showed a considerable improvement over the records of the preceding year, and amounted in all to 441,159 tons valued at $2,043,145, as compared with an output in 1921 of 386,550 tons, valued at $1,785,538.

The increase in the production of metals during the past year amounting to approximately $12,000,000 in value, marks a resumption of progress in the metal mining field and points the way to greater prosperity. The slight decline in the production of non-metallics including coal, amounted to about $5,260,343 in value, and since the greater part of this decrease was due to loss of production caused through labor troubles, the slight set-back may be regarded as negligible. In the successful marketing of structural materials and clay products the revival of the building industry has played a great part and during the past year the production of these materials has been considerably increased.

The recovery in mineral production as a whole then to a total value of $183,029,595 may be considered as most propitious. Comparison with preceding years shows that 1920, 1918 and 1917 (when war prices prevailed) were the only years in which this valuation was exceeded.

INTERNATIONAL NICKEL COMPANY'S NEW ROLLING MILLS

With the opening of the new refinery and rolling mills of the International Nickel Company at Huntingdon, West Virginia, the most modern and largest rolling mills devoted solely to production of monel metal and malleable nickel are now in operation. The main purpose of these new rolling mills is to give an assured supply of monel metal of uniform quality. As is well known, the chief characteristic of monel metal is its non-corrodibility combined with a strength of steel.

Before the erection of the new plant at Huntingdon, the practise was to ship the matte from the Canadian smelters to the refinery at Bayonne, N.J., where it was refined and cast either in pigs, or the form of small ingots. These were then shipped to rolling mills engaged in the production of steel. Obviously, a plant designed for fabricating steel and a staff trained in steel handling could not do justice to the production of monel metal. This situation therefore led to the scrapping of the Bayonne plant, the nickel refinery being transferred to the Port Colborne, Ontario refinery and the new plant at Huntingdon erected for the production of monel metal and malleable nickel.

Outline of Monel Metal Processes

When taken from the mines in Canada, the ore is subjected to a preliminary refining process which reduces it to the form of matte. This matte is received in carload lots from the refinery at the mines in Canada. The conveyors elevate the matte to a special type ball mill which grinds it to the consistency of coarse sand and delivers it to a large hopper.

From this hopper it is sent to the calcining furnaces, a series of which occupy most of the floor space of one of the large unit buildings, known as the matte grinding and calcining furnace department. These furnaces are all heated by natural gas, so that in this, as well as in the numerous subsequent heating processes, there is no possibility of impurities entering the metal from the fuel. After passing through the calcining furnaces, the metal goes to the reverberatory furnaces and from them cast as pigs. The waste heat from the latter battery of furnaces is utilized to fire large boilers which will supply the ordinary steam requirements of the four large hammers. As a standby for the latter, natural gas fired boilers are installed in the hammer shop.

From the reverberatory furnaces the metal in the form of pigs goes to the electric furnaces where it is remelted and cast in the form of 2-ton ingots. The equipment in this department consists of one 3-ton Moore electric furnace and one 7-ton Heroult electric furnace, so that its present capacity is in excess of that of the remaining departments as at present equipped, while provision has also been made for the installation of further electric furnace units as required. So far as refining in electric furnaces and ingot casting are concerned, the handling of monel metal in this department does not differ materially from the usual steel mill practice.

Number of Special Operations

In the next step in its reduction to commercial form, a number of operations are involved that are entirely lacking in steel processing. In the case of steel, the ingot goes directly to the soaking pit, the time required for this part of the process is short and involves little additional expense as compared with the time and processes through which the monel metal ingots must go after leaving the ingot mold and before they can be delivered to the rolling mill. Steel is a metal very susceptible to oxidation and surface defects on the ingots are automatically removed by the heating and rolling processes in which the oxidation scales off, leaving clean metal. Monel metal, on the other hand, is highly resistant to oxidation so that it is necessary to remove the outer skin of the ingot completely with its accompanying surface defects before proceeding to the heating and rolling.

Consisting chiefly of nickel and copper as it does, the metallurgy of monel metal is radically different from that of steel, so that its successful production is naturally a highly specialized undertaking which can only be carried out by skilled men experienced in its handling. In the course of manufacture up to this point, certain defects, or oxides, are allowed to remain in the ingot. These oxides do not combine chemically with the metal, but appear on, or close to the surface of the ingot as physical defects. These defects, however, must be removed before the metal can undergo any further processes.

The ingots are accordingly taken to milling machines where a heavy cut is taken off each side. As an extra precaution to insure satisfactory quality the milled ingots are examined and any defects remaining are chipped out with pneumatic hammers.

Equipment Provided on a Liberal Scale

After the chipping processes the ingots go back to another battery of furnaces in the hammer department, where they are cogged down to bloom size. The steam hammers employed in this department range from eight-ton capacity down to fifteen hundred pounds, so that ample provision is at hand for the making of special forgings of Monel Metal or nickel, in addition to the usual production of Monel Metal blooms for the rolling mill itself.

After heating in the battery of furnaces in the rolling mill department itself, these billets go to the 24-inch merchant mill for conversion into sheet bars, or to the rod mill. So far as the actual handling of Monel Metal is concerned, either in the merchant or the rod mill, or in its subsequent reduction in the sheet mills in another unit, there is no apparent difference between its production and that of steel. With a metal consisting chiefly of nickel and copper, the greatest problems are naturally involved in the heating of it, and this is equally true in every step of the process from the calcining furnace to the final annealing processes.

Some Features of the Sheet Mill

The bars from the merchant mill go to the sheet mill which is a most complete, specially designed plant for the production of Monel Metal sheets and which will do more to overcome the difficulties in providing an adequate supply of Monel Metal sheets than has been possible up to this time, since a very large part of the production difficulties have had to do with the rolling of sheets. In this department, as is also true of all of the others, while equipment has already been installed with a capacity far in excess of the actual requirements, ample provision has also been allowed for expansion and the installation of additional units whenever required, so that with an ample supply of high grade metal direct from its own furnaces and rolling mills, The International Nickel Company will be in a position to maintain adequate stock of all sizes and guages of monel metal sheets. Grinding machinery has been installed to make it possible to deliver monel metal and nickel sheets ground to a good surface so that a wide range of articles may be produced from these sheets with the minimum amount of buffing in the finished form.

The Laboratories

A feature of the new mills are the chemical and physical laboratories, permanently housed in a building specially planned for this purpose. The staff of the laboratories is at the service of manufacturers in their problems.

Both monel metal and nickel will be produced at the new mills in the form of rods from 7/32-inch up to 12-inch round, square, or hexagonal, and in sheets from .018 to ¼-inch.

Increase of 41 per cent. in Ontario Gold Production During 1922

Preliminary Report on 1922 Production*

Prepared by W. R. ROGERS, Statistician, Department of Mines, Province of Ontario

THE following table, subject to revision, summarizes the mineral production of Ontario for 1922. As far as possible the figures represent quantities shipped and values received for marketed products. Tons throughout are short tons of 2,000 pounds. Preliminary figures for 1921 are given for comparison.

Summary of Mineral Statistics, 1922
(Comparative figures for 1921)

Product	1921 Quantity	1921 Value	1922 Quantity	1922 Value
		$		$
METALLIC				
Gold.....ounces	709,509	14,624,085	1,000,199	20,674,109
Silver..... "	8,412,059	5,497,160	9,167,846	6,491,971
Platinum metals (a)..... "	915	51,060	642	38,884
Copper.....lbs.	3,070,719	356,708	4,503,358	515,093
Nickel, metallic..... "	5,430,147	1,825,359	11,175,326	3,171,434
Nickel, oxide..... "	1,402,019	285,391	2,399,887	391,119
Cobalt, metallic..... "	32,718	98,228	109,067	282,602
Cobalt, oxide..... "	155,554	354,418	398,697	798,271
Other nickel and cobalt compounds and residues..... "	108,814	114,069	1,070,935	255,034
Copper in matte exported, (b).....tons	3,686	737,142	7,774	1,554,731
Nickel in matte exported (b) "	4,850	1,939,851	8,689	3,475,649
Lead, pig.....lbs.	3,570,222	190,843	2,895,695	173,642
Zinc..... "	.....	.....	100,283	2,181
Iron ore and briquettes (c). tons	100	459	4,304	25,261
Iron, pig (d)..... "	82,838	2,079,729	14,052	340,730
Total metallic.....	.....	27,574,202	.....	38,190,711
NON-METALLIC				
Actinolite.....tons	78	975	50	345
Apatite (Phosphate of Lime) lbs.	.....	.....	31	248
Arsenic, white..... "	2,982,525	233,763	4,118,695	299,940
Arsenate of Iron..... "	.....	.....	75,000	938
Corundum.....ton	402	50,250	.....	.....
Feldspar, crude and ground. "	15,506	114,059	15,515	94,985
Fluorspar..... "	115	1,744	284	3,905
Graphite, crude and refined. "	363	23,273	626	34,124
Gypsum, crushed, ground and calcined..... "	84,765	433,053	110,227	621,668
Iron Pyrites..... "	19,375	91,604	11,235	39,763
Mica..... "	222	29,630	2,229	56,480
Mineral water.....Imp. gals.	.....	9,000	31,970	6,118
Natural gas.....M. cu. ft.	8,590,000	2,953,000	7,919,390	3,902,800
Peat.....tons	500	2,000	3,000	14,500
Petroleum, crude.....bbls.	172,859	466,716	164,732	439,286
Quartz and silica brick.....tons	12,957	74,635	81,168	149,302
Salt..... "	149,599	1,509,287	161,551	1,537,512
Talc, crude and ground.... "	9,967	140,390	12,874	178,397
Construction Materials—($11,527,529)				
Cement, Portland.....bbls.	2,723,072	6,425,266	3,104,386	6,235,370
Lime.....tons	91,355	1,172,680	116,769	1,315,479
Sand and gravel.....cu.yds.	1,412,956	668,098	2,132,875	963,922
Sand-Lime brick.....M.	.....	456,700	48,924	770,597
Stone, building, trap, granite.	.....	1,812,863	.....	2,205,025
Clay Products—($5,103,618)				
Brick, common.....M.	99,463	1,743,094	105,536	1,803,349
Brick, pressed..... "	31,481	673,087	44,892	900,111
Brick, tapestry or rug.... "			22,453	514,666
Tile, drain..... "	9,910	250,040	10,110	260,312
Tile, building and floor... tons	.....	211,529	.....	562,566
Pottery.....	.....	67,985	.....	88,889
Sewer pipe.....	.....	939,464	.....	973,824
Total non-metallic.....	.....	20,554,185	.....	24,011,458
Add metallic.....	.....	27,574,202	.....	38,190,711
Grand Total.....	.....	48,128,387	.....	62,202,169

(a) Recoveries from Canadian and United States refineries.
(b) Copper and nickel exports in the form of matte were valued, respectively, at 10 and 20 cents per pound in both years.
(c) Exports and shipments to points other than Ontario blast furnaces.
(d) Proportional product from Ontario ore smelted.
(e) Recovery from concentrates shipped in 1919 and not previously reported.

Experience during the past few years has shown that the average final figures for total metallic production exceed those of the preliminary statement by less than 2 per cent., while in the non-metallic list preliminary figures as given in this bulletin are increased by about 7 per cent. when returns are complete.

The Year in Ontario

Following a year of depression which inevitably succeeded the abnormally large output stimulated by the high prices of 1920, Ontario's mineral production in 1922 was very gratifying. During the latter part of the year there was a revival in nickel-copper mining, smelting and refining operations, showing that surplus stocks, the accumulation of over-production in previous post-war years, had finally been absorbed. The mining industry as a whole is on a more stable basis than a year ago.

Outstanding in importance is the rapid increase in Ontario's gold production, exceeding the 1921 output by 41 per cent. or six million dollars, and showing approximately the same advance over the next largest producer among the Provinces or States of the American continent.

Such a record, in a year when the world's production of gold (about $316,000,000) was the lowest for two decades, has attracted the attention of the investing public at home and abroad. To the end of 1922, the Hollinger Consolidated, Ontario's leading gold mine, produced $60,727,850 in gold and silver. In the aggregate, non-metallic minerals, clay products and construction materials show a marked advance over the 1921 output.

PRODUCTION OF GOLD, 1922

Source	Bullion and residues shipped: Ore Milled tons	Gold Assay content Fine ounces	Silver Assay content Fine ounces	Total Value, Gold and Silver
PORCUPINE				
Clifton Porcupine.....	.....	79.887	20.97	$ 1,644.25
Dome.....	368,400	201,124.476	29,249.71	4,178,936.20
Hollinger Consolidated.	1,491,381	590,385.615	104,444.03	12,274,114.00
McIntyre.....	217,208	103,819.737	18,435.12	2,137,372.69
Total.....	2,076,989	895,409.715	152,149.83	18,592,087.14
KIRKLAND LAKE				
Kirkland Lake.....	37,489	10,813.635	1,279.19	224,396.11
Kirkland Lake Proprietary.....	16,108	5,144.264	1,870.40	97,481.02
Lake Shore.....	24,247	22,737.172	1,974.51	471,340.55
Ontario-Kirkland.....	6,496	483.249	142.88	10,082.04
Teck-Hughes.....	41,194	28,779.860	2,321.85	596,495.13
Wright-Hargreaves....	66,181	36,520.732	4,865.68	762,752.84
Total.....	191,715	104,478.912	12,454.51	2,162,547.69
MISCELLANEOUS				
Cobalt-Frontenac (E. Ontario).....	.....	50.198	26.20	1,055.92
White Rock (W. Shiningtree).....	.....	47.421	10.07	987.18
Silver and Nickel-Copper refining.....	.....	212.542	.....	4,182.18
Total.....	.....	310.161	36.27	6,225.28
GRAND TOTAL....	.....	1,000,198.788	164,640.61	20,760,942.11

Several mines and prospects not producing at present are expected to add their quota of gold bullion before the end of 1923. Mills are now being erected at the Night Hawk Peninsular and Argonaut mines, the latter being in Gauthier township. Certain Porcupine mines that had a production before high operating costs forced closing down during the war are again being actively developed. Other important prospects are receiving thorough exploration. Encouraging results have been obtained by the Crown Reserve and Associated Goldfields at Larder Lake, on the Murphy claim at Goudreau and the Longworth property at Schreiber. In northwestern Ontario, plans are under way to re-open the St. Anthony Sturgeon Lake, the Foley at Mine Centre, and the Mikado in the Lake of the Woods area.

At Kirkland Lake extensive development has proceeded in Lebel township to the east of the producing area. Mill enlargement has been decided upon by the Lake Shore, and Wright-Hargreaves, and shaft sinking to the 1,000-foot level is proceeding at the Teck-Hughes and Wright-Hargreaves.

*This article does not include the complete preliminary report prepared by Mr Rogers. Further extracts will appear in our April issue.

Deep mining by the Dome and McIntyre has revealed high-grade ore. Late in the year a high grade vein was found on the latter property at a vertical depth of 2,125 feet, and a single ore chute, 1,200 feet long, has been proven on the 1,875-foot level.

The Ontario Government has arranged to purchase small lots of gold ore from operators of prospects and paid for those after sampling at the Temiskaming Testing Laboratories. When a carload lot has accumulated it will be shipped to the Hollinger mine for milling and treatment. Four parcels of ore were purchased in this way during 1922, the combined weight being 3,193 pounds.

Most of the gross bullion is shipped to the Royal Mint at Ottawa, which reports precious metals contents of shipments received as 979,338 fine ounces of gold, and 160,312 fine ounces of silver, the average content of gross bullion being .793 gold and .130 silver.

In addition to the above values, gold mining companies receive the exchange premium on New York funds, which amounted to $208,621 in 1922; $1,359,600 in 1921, and $1,376,275 in 1920. Commencing practically at par in 1918 the premium has alternately risen and fallen, reaching 20 per cent. in December, 1920, and falling back below par in the fall of 1922. The average exchange rate was less than 2 per cent. in 1918 and 1921; about 4 in 1919; 12.27 in 1920, and 11.61 per cent. in 1921. Of all combatant countries suffering currency depreciation as a result of the Great War, Canada is the first to get back to normal. Although the exchange rate rose since the end of the year to around 2 per cent., it would appear that the full cycle of abnormal rates has been completed.

Silver

Production at Cobalt was well maintained, the average New York price of silver being 67.52 cents in 1922 as compared with 62.65 cents per ounce in 1921. The McKinley-Darragh-Savage, which along with several other silver mines shut down in the fall of 1920 owing to power shortage and the low price of silver, re-opened the latter part of May, 1922, and had a creditable production. Former prominent producing mines, such as the Beaver, Timiskaming, Kerr Lake and Crown Reserve, were idle throughout the year. Attention during 1922 was focused on South Lorrain, where the Keeley and Frontier mines encountered exceedinlgy rich ore, and made large shipments. The ore at the Frontier mine has a high cobalt content, averaging about 12 per cent. The Miller Lake O'Brien and Castle-Trethewey mines were operated at Gowganda.

Silver shipments for 1922 reported to date are summarized as follows:—

	Fine ounces	Value $
Cobalt and other silver areas	9,007,653	6,408,867
Gold mines	164,641	86,634
Canadian nickel-copper refineries	12,212	8,016
Total	9,184,506	6,503,517

Nickel, Copper and Platinum Metals

Owing to the continued overstocked condition of the copper and nickel markets, mining, smelting and refining operations were greatly curtailed. The Mond Nickel Company was the only smelter operated for the full year. The International Nickel Company of Canada re-opened its Port Colborne refinery on May 1st. Nickel-copper matte on hand at Bayonne, N.J. (1,094 tons), was re-shipped to Port Colborne, where all refining operations will be conducted hereafter. The Bayonne plant has been scrapped, and some of the equipment shipped to Port Colborne. All mining and smelting operations by this company were suspended in August, 1921. The Copper Cliff smelter was re-started on September 1st, two converters being placed in commission. The Creighton mine was re-opened a week previously. During the dull period, new uses and new markets have been found for nickel and "monel" metal. As a result of the growing market for this alloy the International company placed in operation a new rolling mill at Huntingdon, West Virginia for the manufacture of monel metal products. This plant treats nickel-copper matte directly and received during the year 1,838 tons of matte from Copper Cliff. No operations were carried on at the mine and smelter of the British America Nickel Corporation, but there was a small recovery of gold and platinum metals from experimental work carried on at the Deschenes refinery. Nickel oxide and metallic nickel recovered from the refining of silver ores now forms but a small proportion of the total output of these products, the quantities marketed in 1922 being 109,853 pounds of metallic nickel and 10,047 pounds of oxide. The average price of electrolytic copper for the period was 13.382 cents per pound.

Platinum Metals.—The recoveries reported in the table were made at Deschenes, Port Colborne and Bayonne, New Jersey. These include platinum, 176.18 ounces; palladium, 341.44 ounces and 124.44 ounces of a group including rhodium, ruthenium, osmium and iridium. Rhodium formed by far the larger percentage of this group. The average price for platinum advanced from $75.03 in 1921 to $97.61 in 1922. Palladium and rhodium group metals were valued at $45 per ounce for the purpose of this report.

Iron Ore and Pig Iron

Although no producing iron mines were in operation during the year, shipments of ore and briquettes from storage totalled 16,108 short tons, of which 11,608 went to blast furnaces and 4,304 tons to Electro-Metals, Limited, of Welland, manufacturers of ferro-silicon. The bulk of the tonnage went to Hamilton for experimental work under observation by the Iron Ore Committee appointed by the Provincial Government last October for the purpose of investigating the best commercial methods of beneficiating Ontario's low grade iron ores.

POTTERY-MAKING IN THE BLUE NILE

In the April-July issue of Sudan Notes and Records, Mr. H. A. Macmichael writes on the Blue Nile pottery industry, which is very unlike Canadian pottery-making. The manufacture of the vessels which he describes are the "Burma," or pots for carrying and storing water; and the water-jars used for the "Sagias" or water-wheels. The implements used are a roughly smoothed lump of stone the size and shape of a penny bun, and an oblong, slightly concave, river shell, which, if unprocurable, can be replaced by a fragment of dry water-melon husk. With these, the lump of clay is kneaded with donkey's dung, is beaten into shape, and smoothed. The industry of making the "Sagia" jars is not originally found in the Sudan; but is rather Nubian and Riverian.

LACQUER VERSUS PAINT

Attention has been drawn to the prediction that before long the use of lacquer for use on wood will have supplanted paint and varnish in many fields, by the fact that leading paint and varnish manufacturers are seeking to develop distinctive lacquer formulas. It is held that lacquer, when properly made, has all the advantages of paint and varnish products made partially of oxidized materials and has also distinct advantages of its own, which supersedes disadvantages of the other products. It produces a superior finish, will not check, dries quickly, and can be made to produce any kind of finish desired with fewer coats than in the case of paint and varnish.

QUEENSLAND TIMBERS FOR PAPER-MAKING

The West Australian Forest Products Laboratory, which discovered some time ago that the hoop pine and the silky oak are suitable for making brown paper, now announces that the common cyprus pine is superior to these, and that it yields a paper which is lighter, thicker, and stronger than imported Kraft paper. It has also found that the silky elm or brown oak of the coastal forest is almost equal in value to the cypress pine.

World Conditions and News in Chemical Fields

(Special Correspondence to Canadian Chemistry and (Metallurgy by our London Representative.)

British Chemical Trade

The British overseas Dominions, especially Ausralia and India, have been quite large buyers recently in Great Britain, and inquiries for chemicals have also been received, from Japan on a wide range of products. German competition has been much easier to meet, as at the present time, through shortage of supplies owing to the big orders booked in the past and the much higher prices asked for future delivery, Germany is losing her command of many of the markets of the world.

Electro-Chroming of Metals

Sheffield research chemists have achieved yet another success in the field of stainless metals, and articles of steel, iron and other metals have been successfully "electro-chromed." The deposit of chromium is hard, and takes on a brilliant polish which does not tarnish. It is not known yet how the discovery will work out in practice, but it is believed that it will be a competitor with stainless steel, and that it will largely supersede the process of silver-plating steel knives.

Norway Carbide Plants Closed

Norway has eight modern, well-equipped calcium carbide plants, three of them built during the war, with a total annual output capacity of about 265,000 tons. These plants have installed about 170,000 horsepower, and in full operation, employ about 3,000 men. Several of them are now completely closed down, and the others are operating with small or minimum forces. The single cyanamid factory in Norway, with an annual capacity of 75,000 tons, has been closed down for more than a year, and it is extremely doubtful whether it will ever again be in operation.

Glass Trade Improving in Great Britain

The British glass trade continues to have a fair share of the general, trade improvement, and inquiries show that manufacturers are optimistic in regard to 1923 business. Some of the Midlands houses have been working full time for some weeks, and the steady influx of orders will ensure work for the operatives until well into 1923. During the eleven months ended November 30th last, 313,088 gross of English-made glass bottles and jars were exported from Great Britain, the number for the corresponding period of 1921 being 286,540 gross. The United Glass Bottle Manufacturers, Limited, consists of six of the leading manufacturers in the United Kingdom, and each specializes in one or more particular makes. British exports of glass manufactures reached a total value for the eleven months of £1,932,684 as compared with £2,036,327 for the corresponding months of 1921 when prices were considerably higher. The year's progress may, therefore, be regarded as quite good.

Motor Fuel From "Prickly Pear"

A Company styled "The South African Motor Fuel Development Company, Limited," has been registered at Bloemfontein, with a capital of £100,000. The object of the company is to carry on in South Africa and elsewhere, the business of manufacturers and dealers in industrial alcohol, motor fuel and fuel for lighting and heating purposes, and by-products arising from such manufacturers (vinegar, syrup, yeast oil, and fruit jellies). The raw material will be the prickly pear, a pest which infests millions of acres of land, both in South Africa and Australia. It is stated that the motor spirit will be reta led at two shillings per gallon.

Japanese Chemical Industry

The Japanese chemical industry is extremely depressed at present on account of the prevailing economic crisis. The manufacturers have failed in an attempt to induce the Government to raise import duties on chemicals competing with Japanese articles.

Phosphate Fertilizer for Australian Farms

The Australian farmer has benefitted considerably by the joint purchase in 1920 by the British, Australian and New Zealand Governments of the Nauru and Ocean Island phosphate deposits. Out of an output amounting to 544,656 tons during the first eighteen months under the new control, Australia took 357,496 tons, or almost 65 per cent., although entitled under the agreement to only 42 per cent. After treatment in Australia, the price of the resultant superphosphates to the farmer is stated to have averaged only £6 ($29.20) per ton, as against the price of £8 to £11 ($38.96 to $53.53) paid for similar grade elsewhere- This difference in price represented a total saving of over £2,000,000, besides furnishing employment to 2,200 men in the manufacture of superphosphates. It is considered that there is enough phosphate available on the islands to supply requirements for the next two hundred years, and that a new scheme of loading will enable the Commissioners to deliver much larger quantities to meet the increasing demand at less rates than those at present being paid.

Big Developments Pending in Polish Chemical Industry

The union of Upper Silesia with the Polish Republic is of great importance to the development of the chemical industries of that country as great quantities of sulphuric acid are produced in thirteen Silesian works as a by-product from zinc-blende, and this by-product serves as a basis for the production of super-phosphates. A second feature of first-rate importance is the discovery of rich deposits of phosphorite in the neighborhood of Niezwiska, Galicia, these amounting to over 7,000,000 tons. The phosphorite contains little iron and alumina and an average of about 30% of phosphoric salts. The fertiliser industry is thus destined to attain great importance.

The Polish Government has, furthermore, taken over the synthetic nitrate factory at Chorzow, formerly German state property, the possession of which—together with that of the "Axot" chemical works in Bory (Galicia)—makes Poland largely independent of imported Chilean nitrates.

Soda production is represented by two large factories belonging to the Solvay concern, producing up to 80,000 tons per annum for home and export markets, and there is a steadily increasing production of potash salts and kainite in Kalusz, Galicia.

The chemical treatment of coal is carried on by 11 coke works and 124 gas works; and in Hajkowka is the largest factory in Europe for the dry distillation of wood, there being also a number of other smaller factories for the chemical treatment of the wood of Poland's vast virgin forests.

New German Hearth Furnace for Steelmaking

A new steel foundry recently installed for a Berlin engineering firm uses a hearth melting process which seems to turn out products able to compete with high-grade crucible steel. The furnace, designed by a Swiss engineer, Herr Edwin Bosshardt, allows remarkably high temperatures to be obtained by the joint action of heated fresh air and the gas generated in the producer. this gas being—between the hot air and the narrow flame coming from the white-heat section of the producer—ignited and burnt most rapidly. The whole content of the furnace is poured out into a large ladle raised to a white heat, which enables any sample up to 1½ ton in weight to be cast in the most complicated moulds without any premature cooling. The tenacious and substantial steel castings obtained by the new process will in many cases be a good substitute for bronze as well as complicated forgings. The cost of production of steel castings according to the new method does not materially exceed the cost of steel manufacture in the Martin furnace while the coal consumption, on account of the smallness of the charges, is rather higher. There is no need of being very particular with regard to the composition of charges, for even very hard materials, such as railway rails, old rivets, cover-platest etc., can be readily decarburised.

Mining and Metallurgy in British Columbia

(Special Correspondence to Canadian Chemistry and Metallurgy.)

Granby to Buy Canadian Copper

At a special meeting of the shareholders of the Granby Consolidated Mining Smelting & Power Company, held at New York, on February 8th, arrangements were made to double the issue of common stock and purchase a controlling interest in Canada Copper Corporation. This will be the biggest mining and metallurgical deal that has taken place in British Columbia for a long time. The circular calling the special meeting of the shareholders stated that Canada Copper Corporation is in process of re-organization, and that a new company is being formed to acquire all the properties and assets of the old concern, free of liabilities, and with a reserve of $800,000 in the treasury. Those entitled to the majority of the stock in this new company have offered to exchange their stock for Granby stock, on the basis of 155,000 shares in Granby for 100 per cent. of the stock in the new concern. The exchange is not to be contemplated unless 85 per cent. of the stock in the new company is acquired.

The circular calling the meeting stated further that engineers claim that the Copper Mountain property contains more than ten million tons of ore, averaging 1.74 per cent. of copper. Granby engineers and geologists have made a review of the diamond-drill and developments record and an examination of the workings, and they concede 5,635,980 tons, averaging 1.83 per cent. of copper with small gold and silver values, with the probability of a considerably increased tonnage as development proceeds. The engineers consider that the plant is up to date, but additions will have to be made to bring it up to a rated capacity of 2,000 tons of ore per day. The $800,000 in the treasury of the new concern, it is considered, will be ample for this purpose and, also, to provide working capital until the property is on a profit-producing basis. Arrangements have been made for a supply of power to operate the machinery at mine and mill and for hauling and treatment of the concentrate. The circular does not say what these arrangements are, but the statement would lead one to suppose that arrangements have been made with the Consolidated Mining & Smelting Company for the treatment of the concentrate, with the West Kootenay Power & Light Company for power, and with the Kettle Valley Railway for haulage.

In an interview at Prince Rupert, recently, Mr. H. S. Munroe, general manager of the Granby Co. stated that as soon as weather conditions permitted, a start would be made on a 1,200-ton concentrating plant at Anyox, to treat the low-grade, highly silicious ores of the Hidden Creek mine, which cannot be treated profitably by direct smelting. There is a large reserve of this class of ore. Furthermore, the company will equip the Outsider mine, which it purchased last fall, for extensive production: it will thoroughly explore the George group of claims, at the head of Bear River Valley, and will continue the exploration of the Sunshine group, on Glacier Creek, a tributary of Bear River.

Portland Canal Mines Attract Capital

Recent developments in the Portland Canal district, particularly in the Salmon River Section, are attracting the attention of eastern Canadian capitalists, which is an exceedingly encouraging sign. Previously, nearly all the development has been done by United States capital, which has received a rich reward for its enterprise. Toward the end of January, B.C. Silver Mines, Limited, cut what is beleved to be the extension of the Premier main vein at 1,050 feet ifrom the portal. At the point of intersection, the vein is 40 feet thick, and preliminary assays run from a few cents to $40 per ton. As regards mining, we are a phlegmatic people in British Columbia. The news caused hardly anyone to bat his eye; your correspondent was startled, therefore, to receive a cable from London, which read: "Selukwe booming: what justification?" Seluke Mining & Finance Company holds two-thirds of the stock in B.C. Silver, and in a week the shares jumped from eight shillings and sixpence to thirty-six shillings.

Indian Mines, Limited, which is controlled by eastern Canadian capital and has been operating a property to the north of the Premier has been meeting with such encouraging results that it recently has let a contract for the extension of the bottom tunnel 600 feet. It is thought that this work should open at depth a rich body of silver-lead ore that has been opened at the surface and found in the upper tunnel. Since the company acquired the property, in April of last year, some 1,500 feet of driving has been done, and some promising bodies of ore have been exposed. A level has been driven from the upper tunnel for 265 feet on a 15-foot vein of milling ore. Another vein has been cut in this tunnel, which is believed to be the extension at depth of the one containing argentiferous galena, found at the surface.

Mobile Mines, Limited, which also is being developed by eastern Canada capital, has found good ore on the surface, and is driving a tunnel to develop it at depth. G. D. B. Turner, of Montreal, is consulting engineer for this property and for Indian Mines.

H. B. McGuire has returned from New York, where he succeeded in interesting capital for the development of the Vancouver and Woodbine groups, on Salmon River. An immense low-grade body of ore, 150 feet in width has been opened on the surface, and another strong lode, 700 feet to the north of the larger one, with high-grade exposed at several points, has been found to the north of it.

J. H. Hanthornthwaite, formerly M.P.P. for Nanaimo, and Arthur MacCallum have consolidated a large block of claims to east of the Premier holdings and running across the mountain into Bear River Valley, and have interested eastern Canadian and English capital in the venture.

Britannia M. & S. Co. Starts Mill

Britannia Mining & Smelting Company put its big mill into operation during the last few days of January, and gradually are tuning it up to capacity. Britannia is probably the most financially sound large mining enterprise in the province. Since it closed its mill, in October, 1920, because of the low price of copper, it literally has been through fire and water, and few concerns would have survived the misfortunes that have befallen it. In February, 1921, the mill was completely destroyed by fire, and in October of the same year a flood washed out some 80 miners' cottages and other buildings and killed 16 people. Despite these disasters, the Britannia company kept a large force of men at work, developing and improving its mines. Rather more than a year ago, work on the new mill was commenced; a steel concrete structure now replaces the old wooden one that housed the old mill. The company has developed a large ore reserve, much of it being of a markedly higher grade than that previously worked, and, with the improvement in the price of copper, it has every reason to look forward to a period of prosperity.

An interesting investigation recently completed at the Forests Product Laboratories of Canada, which is likely to have important practical results, relates to the prevention of decay in stored ground wood pulp used in the manufacture of newsprint. The laboratories based their experiments on the fact that wood submerged in water is immune to fungal decay, have investigated the preservative effect on pulp of storage water and have found this method to give results so favorable as to warrant a trial on a commercial scale.

IMPROVEMENT SHOWN IN MINERAL PRODUCTION OF QUEBEC.

The general condition of the mining industry in Quebec at the end of the past year shows a decided improvement as compared with the beginning of 1922, when it was at a low ebb. Although far from normal, the industry is much healthier than a year ago. The production of some of the principal items are considerably higher than for 1921, but the values have not followed proportionately, indicating lower ruling prices. This is a sign of health than otherwise and a step towards normality.

The total value of the mineral production of the Province of Quebec in 1922, reached $17,898,062. This is an increase of $2,375,074, or 15%, as compared with the figures for 1921, when this value was $15,522,988, which had been the lowest since 1916.

It may be observed that, in the United States, the industrial conditions of which always influence Canadian conditions, there has been a revival of activity in metal mining, particularly copper, zinc and lead. The stocks which had accumulated during the last year of the war and the two following years, have been, in a great measure, absorbed, and this has caused a resumption of mining. Unfortunately, the Province of Quebec, so far, has been a producer of non-metallic minerals rather than of ores of metals, so that the effect of the comparatively flourishing metal market has been less felt here than in the provinces which produce metallic ores.

For the purpose of comparison we give the annual value of the mineral production of the Province of Quebec for the last ten years:

1913	$13,119,811	1918	$18,707,762
1914	11,732,783	1919	20,813,670
1915	11,765,873	1920	28,392,939
1916	13,287,024	1921	15,522,988
1917	16,189,179	1922	17,898,060

Asbestos.

Asbestos is by far the principal mineral product of Quebec. In 1922 the asbestos sold and shipped by the Quebec mines was 176,340 tons, valued at $6,058,171, as compared with 84,475 tons valued at $5,199,789 for 1921. During the first part of the year the demand was inactive, the low ebb being reached in April, 1922, whence a slight improvement began to make itself felt. The prices ruling during 1922 were lower than during the preceding years, the long fibre material being specially affected.

Ores of Metals.

For the first time in the history of mining in the Province of Quebec the metalliferous ores do not figure in our table of production. Owing to the development of the American native sulphur industry, the cupiferous pyrite mines of Quebec have ceased to produce and while they probably will resume operations in time, such a resumption may not be near at hand. The zinc and lead mines of Montauban were closed all year. The Federal Zinc and Lead Company carried on development work on their property in Gaspe County, and worked on the construction of the road to connect the mine with the railway at Cascapedia.

Great activity in prospecting for gold and staking of claims has prevailed for the last eight or ten months in the North-western part of the Province of Quebec adjoining Ontario. In the township of Rouyn, Boischatel, Dasserat, Dufresnoy, and Dufay, there are at present in the vicinity of 70,000 acres staked out in mining claims. The discoveries are said to be encouraging, and the geological conditions are very favorable to the occurrence of gold deposits.

Non Metallic Minerals.

Feldspar, mica, magnesite and china clay, are showing signs of a renewal of activity after having suffered greatly during the two preceding years. In all of them, slight increases are recorded. The same remark applies to the production of natural iron oxide, used for mineral paints. Production of feldspar, mica, magnesite and graphite was as follows:

	Production. Quantity.	Value.
Feldspar, tons	12,872	$114,235
Mica, lbs.	888,677	90,518
Magnesite, tons	5,645	76,547
Graphite, lbs.	47,327	1,500

It is interesting to note the beginning of a new industry, in the quarrying of some deposits of steatite or soapstone in the asbestos district. This soapstone, cut in blocks or large bricks, is used as a lining for alkali recovery furnaces in paper-pulp mills. These blocks are cut to size at the quarry by means of circular saws, sheltered under rough buildings. While in point of quantity or value the production of soapstone bricks was not large last year, there is an important consumption of imported product of this nature, which perhaps could be supplied from our Canadian resources. Production of Kaolin and soapstone amounted to 1,296 tons valued at $21,032.

Building Materials.

The building materials industry has had a comparatively successful year. The total value amounted to $11,337,298, or 63% of the total mineral production. In 1921, the production has been $9,888,811, representing also 63% of the total mineral production. Of these the most important item was cement, of which 2,660,810 bbls. were produced valued at $5,906,998.—Abstracted from Preliminary Report of Quebec's mineral production, prepared by Mr. T. C. Denis, Superintendent of Mines, Province of Quebec.

PACKING INDUSTRY INITIATES RESEARCH PROGRAM

At the 17th Annual Meeting of the Institute of American Meat Packers, held recently in Chicago, a strong program for research was adopted. The sum of $50,000 a year for three years will be raised by individual voluntary subscription. For the first year a director of research will be appointed, who will be responsible, with adequate assistance, for the entire scientific work of the Institute. A series of lectures will be instituted dueing the first year, designed to give the men engaged in the packing industry a general survey of the workings of the entire industry including company organization and operation. For the year or two there will be no attempt made to do anything spectacular, but the leaders of the movement are determined to lay the foundations firm at the start. The packing industry is to be commended for instituting such a scheme, and is proof of what can be done even without government assistance.

Canadian Institute of Chemistry, Annual Meeting, Toronto, Ont., May 29th, 30th and 31st, 1923.

Society of Chemical Industry, Canadian Sections, Annual Meeting, Toronto, Ont., May 29th, 30th and 31st, 1923.

American Electrochemical Society, 43rd General Meeting, Hotel Commodore, New York, May 3rd, 4th and 5th, 1923.

Industry and Trade

Industrial Developments---Trade and Company News---Financial Notes---Patents ---Market Review and Prices

Montreal, Que.—A new company, Commercial Alcohols, Limited, has been organized here with a capital of $750,000, to manufacture industrial alcohol from imported molasses. Offices are at 1706 Notre Dame street east.

Gananoque, Ont.—Willard's Chocolates, Limited, Toronto, have purchased the plant erected by the Ontario Milk Products Co. here. The company failed due to a number of causes, and the plant stood idle since 1921. Willards will manufacture milk and cream powder not only for their own use, but for general sale as well.

Toronto, Ont.—Palmolive Co. are calling for tenders for a six-storey addition to their soap plant in order to double their output.

The Maloney Electric Co., whose plant at Windsor was destroyed by fire last September, have purchased the plant at 213 Sterling Road from the Canadian Fairbanks-Morse Co., formerly used as a tractor plant. The Maloney Company are installing new equipment for the manufacture of electric transformers.

Tillsonburg, Ont.—The Borden Co. will reopen their condensed milk plant about April 1.

Welland, Ont.—The plant of the Welland Alloy Steel Corporation, Limited, will be in operation shortly, and plan to employ about 2 000 men. This company purchased the assets of Electric Steel and Metals, Limited, including a plant with two seven-ton Heroult electric furnaces of a yearly capacity of 15,000 tons each. A third furnace of the same size is to be added and a rolling plant is to be installed this year. The Corporation propose to manufacture nickel alloy steel from Sudbury ore.

Toronto, Ont.—Lowe Bros., paint manufacturers, are reported to be considering an extension to their plant.

Hull, Que.—The Mineral Products Co., Limited, are reported to be experimenting with a view to placing a Canadian-made whiting on the market. This company operates a mica grinding plant.

Sault Ste. Marie.—The Algoma Steel Co. are preparing to increase operations at their plant at an early date. It is believed that sufficient business is in sight to warrant a change over to mercantile shapes and possibly equipment may be put in to manufacture street railway "T" rails.

Elk Lake, Ont.—The power plant of the Northern Power Company at Indian Chutes, 12 miles north of Elk Lake, is nearing completion. The first unit of 2,000 h.p. is about completed, and development work will be continued at Indian Chutes and also at High Falls. The work on the transmission line, 50 miles in length, from Indian Chutes to the Porcupine mining district, will begin this year.

St. Catharines, Ont.—An excellent trade was done during the season of 1922 by Niagara District Grape Growers, Limited. The company handled 1,486 cars of grapes as compared with 756 in 1921. The gross turnover was $1,043,976. Growers were paid $45 per ton for all grapes except Niagaras, which brought $42 a ton. The district wineries were the heaviest purchasers.

Victoria, B.C.—One of the biggest fishery deals on this coast in years has been consummated between the Canadian Fish Company, Ltd., and the North Pacific Packers, Ltd., holders of property formerly owned and operated by the Western Packers. Four large canneries become the property of the Canadian Fish Company. In addition, the company is purchasing the Lagoon Bay Cannery. These properties will employ about 300 men during the fishing season and will produce at least 100,000 cases of salmon.

Vancouver, B.C.—It will be of interest to the canning industry to know that according to latest reports all signs point to an enormously increased production of berries in British Columbia this year.

The Marconi London offices have announced their decision to erect shortly a wireless station at Vancouver at a cost of $2,000,000. It will exceed in power any Marconi station now in existence, and will give direct service to London and Sydney, Australia.

New Westminster, B.C.—What is believed to be a record in the construction of a paper mill has been achieved by Westminster Paper Mills, Ltd., of this city. Erection of this plant was started on July 8, 1922, and at 4 p.m., on December 22, 1922, the first paper was produced. The company's product will be made from pulp made in British Columbia, produced by the Whalen Pulp and Paper Mills.

Powell River, B.C.—The Powell River Pulp and Paper Company will embark this spring on a campaign of development that will represent an expenditure of over four millions of dollars when completed. A large steam plant is to be erected, the first unit of which will cost half a million. The developments will extend over two years.

Prince Rupert, B.C.—Two recent arrivals from England Messrs. J. D. Steel and W. Trevana, are going to establish a foundry and boat-building plant here. The initial outlay will be $25,000.

St. John's, Newfoundland.—The iron mines of the Britisb Empire Steel Corporation at Bell pland have re-opened, and a full staff of 2,000 men will be taken on.

Montreal, Que.—Possibilities of water-power development in the Back River are being investigated with a view of generating from 45,000 to 50,000 h.p.

The Southern Canada Power Co., operating on the St. Francis River, is about to undertake the development of another 30,000 h.p. This and other work in prospect will mean the increasing of the capital from $6,000,000 to $20,000,000.

Lethbridge, Alberta.—Farmers in Southern Alberta are again becoming interested in sugar beets. Several years ago a sugar factory was set up at Raymond and a good deal of money spent trying to establish the industry. It failed for a number of reasons, one of which was at that time the labor necessary for taking care of sugar beets was not available in Southern Alberta. There is prospect of the industry being revived.

Montreal, Que.—Construction of the Red Star Refineries, Limited, is progressing. The initial plant will be in operation this spring. The equipment is similar to other petroleum refineries except that Ramage converters are placed between the stills. Dr. A. S. Ramage industrial chemist, is the inventor of the process of which the Red Star Company hold the Canadian rights. One advantage claimed for the process is that high-pressure stills are not required, thus reducing the hazard of operations.

CANADA'S ASBESTOS TRADE WITH GERMANY.

Some Interesting Facts With Regard to This Important Export.

Asbestos ranks second in exports from Canada to Germany since the war. Grain, of course, comes first. During 1922 Germany imported fairly large quantities of Canadian asbestos, but recently, according to Trade Commissioner L. D. Wilgress, there has been a falling off due to the advanced prices in Canada and the difficulties arising out of the depreciated exchange. Before the war Canada and Russia supplied the asbestos requirements of Germany almost exclusively, but now Rhodesia is a formidable competitor. Rhodesian asbestos is somewhat harder and more brittle than the Canadian product, and lately German manufacturers are showing a marked preference for the Canadian grade. For the nine months ending September, 1922, Germany imported 93,426 bags of Canadian asbestos, averaging 100 pounds each.

The first consignment of Russian asbestos to reach Hamburg after the war was in December, 1921. No further shipment arrived until September, 1922, when 21,292 bags were received, followed by 7,122 bags in October and 9.146 bags in November, making a total of 37,560 bags imported from Russia during 1922. This ashestos was exported by the Russian Soviet Government, who endeavored to sell through its organization in Hamburg direct to consumers against foreign currency. They were, states Mr. Wilgress, only successful in selling a part this way, and were compelled to seek the assistance of importers in liquidating the remainder. From the condition of the bags it was evident that the asbestos was part of old stocks which accumulated in Russia during the war. But little asbestos has been produced in Russia in recent years, although it is believed that attempts are being made to interest American and other capitalists in concessions for working the Russian mines. Before the war Russia was Canada's chief competitor in the asbestos trade with Germany. The decrease noted of late in demand for Canadian asbestos is largely due to the advanced prices owing to heavy buying of the Canadian product by American consumers. At the same time the fall in the value of the mark has made it difficult for the German manufacturer to pay high prices for raw material, but the present unsatisfactory state of this German trade is regarded as only temporary, due to the prevailing uncertainty of internal German conditions.

CONTRACT FOR TUBULAR BOILERS.

A contract has been awarded by the Toronto Transportation Commission for four 72 inches by 20 feet Horizontal Return Tubular Boilers, 125 lbs. working pressure, built to Ontario codes, to the Engineering & Machine Works of Canada, Limited, of St. Catharines. A large breeching construction, 7 feet by 5 feet, and 60 feet long, connects the boilers to the stack. These boilers will be installed in the new $1,000,000 repair shops being erected on Bathurst street by the T. T. C. Keen competition, not only in regard to price, but in regard to quality of workmanship, in which the T. T. C. is very particular, characterized the letting of this contract.

DEVELOPMENTS AT MALAGASH SALT DEPOSIT.

Considerable development work has been done at the salt deposits at Malagash, Nova Scotia, by Messrs. Chambers and MacKay, miners and manufacturers, of New Glasgow, N.S. This deposit came into prominence about two years ago as being a very valuable source of natural rock salt, and also as having considerable potash possibilities. During the present year the owners hope to conclude further investigations in order to determine the actual commercial possibilities of the potash content of the deposit. Last November a six-foot seam of pure white salt was unearthed at the deposit, which on analysis showed to be 99.1 per cent. pure sodium chloride. Before this seam was located at a depth of 200 feet the salt mined contained a small percentage of gypsum, which, while not actually impairing the salt, yet made it difficult to sell in competition with other salts, as the small particles of gypsum gave the salt a grayish appearance. The owner's faith in the mine was rewarded, however, when this pure white seam, 6 feet wide, was exposed. This seam has since been uncovered further, showing a width of 11 feet, and apparently continues downward at about an angle of 80 degrees to great depth. The proprietors have now entered the market with a pure domestic salt.

Two zones in the salt strata have been found to contain varying percentages of potash and salt, and from these zones the salt has been mined and used for fertilizer purposes. It is believed that this end of the business will eventually prove a valuable one. The potash was found at Malagash at a depth of 100 feet, and the owners feel confident that more will be found at a greater depth, as in the world-famous German deposits the potash was not found until a depth of over 1,500 feet had been reached.

Messrs. Chambers and MacKay have built up considerable business from this deposit, and during 1922 shipped over 5,000 tons of salt. The fish-curing industry has been a large buyer, also the railways for refrigeration purposes. The coal mines in the Maritimes have also purchased considerable for pickling pit timber as a preventative of rot.

Salt that is mined at depth as at Malagash does not contain the "red bacteria" common to solar evaporated salt, and this fact, makes the Malagash salt particularly valuable to the fish-curing industry, as considerable loss has been experienced from this cause on shipments to tropical countries.

CANADIAN TRADE—12 MONTHS ENDING JANUARY, 1923.

Some interesting data are made available in a recent report of the Dominion Bureau of Statistics on the trade of Canada for the twelve months ending January, 1921-22-23. Total imports are shown as slightly increased for the period ending January, 1923, as compared with the similar 1922 period, the total imports for the 1922 period being valued at $778,702,513, and for the 12 months ending January, 1923, as $778,948,901. Imports of chemical products show a substantial increase, the value of these imports increasing from $24,905,505 for the 1922 period to $25,714,489 for the similar period ending January, 1923. Imports of chemical products for the 1923 period from the United Kingdom amounted to $3,722,700, and from the United States $18,264,086. Total trade imports from Germany for the 1922 period were valued at $2,385,406, but these fell off to $2,199,232 for the similar period ending January, 1923. Total exports to the United Kingdom for the 12 months ending January, 1923 were valued at $379,540,481, and to the United States at $349,292,392. Total imports from the United States for the 12 months ending January, 1922, were valued at $536,865,528 as compared with $525,371,570 for the similar period ending January, 1923.

"GOLD RUSH" IN NORTHERN QUEBEC.

What has every prospect of being the largest gold mining development since the days of Porcupine and Kirkland Lake in Northern Ontario is now under way in the Township of Rouyn in Northern Quebec, about 50 miles east of Dane, Ont. Many prospectors have already gone in by trail from Dane, and a number of claims staked throughout the township. Up to last November but scant attention had been paid to the gold possibilities in this district, but reports of a vein having been followed for two miles and yielding medium grade values, brought on the "rush," which is still in progress. There are many more or less "wild" reports coming from the new area, but it is a fact that commercial ore has been opened up for lengths of from 200 to 300 feet, running from about $8 to $10 per ton in gold, and that is regarded as enough to insure the development of the field. The Quebec Government has an agent at Ville Marie granting permits for prospecting, but applications for prospecting must still go to Quebec City, a tedious process, to overcome which the Government plans establishing a mine recorder's office at Ville Marie. It is reported that the C. P. R. contemplate building a line into the new field.

KROMOLINES IN THE LEATHER INDUSTRY.

Kromoline and Whitcol Grease are trade names of new products developed by the British Dyestuff Corporation for the purpose of dyeing vegetable and chrome-tanned leathers.

In general they may be used alone or in conjunction with the natural oils and fats for the lubrication of leather fibres. One product is a treated oil, and has the property of forming emulsions of great stability with cod, mineral, castor, and linseed oils, or with tallow and wool fat. This is used in vegetable tanned light leather manufacture. Kromoline contains no soap, and in this way differs from many emulsions made by tanners. The literature put out by the company in this connection discusses the advance claimed for this product, and contains considerable good information for all tanners. This may be had from the Montreal office.

BIG PULP TIMBER DEAL.

The Ontario Paper Company, of Thorold, Ont., acting, it is understood, on behalf of the Chicago Trihune owners, has contracted with the Provincial Government to purchase timber covering 2,000 square miles in the River Manicouagan district, Ontario. The company got the timber for $3.35 per square mile plus the cutting tax of $2.70 per 1,000 feet of timber, outbidding two other concerns. The contract calls for development of water-powers on the limit, and the company's engineers are now surveying the property with a view to the erection of a pulp mill.

PRODUCTION OF BASQUE CHEMICAL COMPANY.

The Basque Chemical Company produced 12,000 tons of magnesium sulphate during 1922 from its lake near Ashcroft, B.C.

Only a small amount of sodium carbonate was recovered from Meadow Lake, near Clinton, during last year.

REPORTS RECEIVED.

The Canada Year Book, 1921.—This well-known annual compiled by the Dominion Bureau of Statistics, Ottawa, improves at each publication. The outstanding feature of the Year Book for 1921 is an increase in the scope of the publication. Historical details have been added to many sections and sub-sections, and historical tables have been inserted to illustrate progress since Confederation. The subjects dealt with are in order as follows: Constitution and Government, Provincial and Local Government, Chronological History of Canada, Geographical, Geological, and Flora and Fauna Data, Area and Population, Vital Statistics, Immigration, Education, Climate and Meteorology. Production—Agriculture, Furs, Forestry, Fisheries, Minerals, Manufactures, Water Powers, Trade and Commerce, Patents, Transportaation—Steam and Electric Railways, Motor Vehicles, Canals, Shipping, Telegraphs, Telephones, Labor, Wages and Prices, Dominion and Provincial Financial Reports, Insurance, Administration, Legislation and Principal Events of 1921. The book comprises over 900 pages excellently printed and well-bound, and containing many useful maps and charts. This edition of the Year Book was edited by Mr. S. A. Cudmore, M.A., F.S.S., and is a compilation full of much useful data as well as many pages of interesting reading for the leisure hour.

The Work of the Division of Chemistry, Department of Agriculture, Ottawa.

Interim Report of the Dominion Chemist, Frank T. Shutt, M.A., D.Sc., F.I.C.—This is the latest annual report of the Division of Chemistry, Department of Agriculture, and covers the year ending March 31st, 1922. During the year several new and special investigations were successfully undertaken by the division, including investigational work with soils, fertilizers, feeding stuffs, sugar beets, field roots, silage and forage crops, waters, etc. It is noted that the chemical service for farmers is increasing yearly. This service is carried on chiefly by correspondence, and includes analyzing samples and giving advice. Mention should also be made of the large amount of work undertaken by the division for the Meat and Canned Goods Division, Department of Agriculture, comprising the chemical and microscopical examination of all samples from the packing houses and canneries throughout the Dominion. Copies of the report may be secured from the Department.

BUFFALO FOUNDRY AND MACHINE COMPANY ELECTS NEW OFFICERS.

The Board of Directors of the Buffalo Foundry and Machine Company, manufacturers of the widely-known "Buflovak" and "Buflokast" vacuum drying apparatus, evaporators and chemical machinery, at a recent board meeting announced the election of two new officers.

Mr. C. W. Pearson, who has been associated with the company in various managerial positions for a number of years, and for the past year in charge of sales, becomes vice-president and treasurer. In addition to the new duties his promotion will bring, Mr. Pearson will continue as director of sales.

Mr. P. J. Krentz, who for a number of years past has been works manager, has also been elected as vice-president. As in the past, he will continue actively in charge of manufacture and production. Both Mr. Pearson and Mr. Krentz have been with the company almost from its very organization, and their promotions come as no surprise to those familiar with their activities.

PLANS COMPLETED FOR PAPER INDUSTRIES EXPOSITION.

Plans are now fairly well completed for the big Paper Industries Exposition to be held at Grand Central Palace, New York, week of April 9th. This event promises to be an industrial affair of considerable magnitude and importance, and Canadian manufacturers, engineers and chemists who can arrange to be in New York during that week need have no fear of being disappointed in their expectations of the Exposition. Charles F. Roth, under whose management the chemical expositions have been held, is in charge of the Paper Industries Exposition. The American Paper and Pulp Association and National Paper Trade Association are holding their annual meetings in New York the same week, and thus a larger attendance at the Exposition is already assured.

NEW AGENCIES FOR CANADIAN FIRM.

Prescott & Company, 14 St. Sacrament street, Montreal, have recently secured the following agencies:

Southern Dyestuffs Co., West Nitro, Va., Beta Napthol; Seydel Chemical Co., West Nitro, Va., Paranitroaniline and Pharmaceuticals; Garfield Aniline Works, Garfield N.J., Acid, Chrome and Benzo types; Peerless Color Co., Plainfield, N.J., Primuline and direct derivatives; Holland Aniline Co., Holland, Mich., Purple and Violet Base, and Basic types; Po Ambo Chemical Co., Matawan, N.J., Tobias and "B" Acid; Granton Chemical Co., New York City, Aniline Oil and Salt; Dehrook Co, Inc., Brooklyn, N.Y., Bromo Acids, Eosine and Phloxine; Hydrocarbon Chemical Co., Lancaster, Pa., Alkali and Reflex Blues, Base, Pastes and Salt; Brandram-Henderson, Ltd., Montreal, Que., Pure Chemical Colors and Pigments; Dye Products and Chemical Co., New York City, Bismarck Browns and Azo types.

PERSONAL.

Mr. A. H. W. Joyner has sold his interest in A. H. Winter Joyner, Limited, Toronto, to Mr. A. V. Walker, and has severed his connection with that company. Mr. Joyner has opened offices at Room 6, 28 Wellington street east, Toronto.

Mr. H. Gardner McKerrow, formerly advertising manager for the National Aniline and Chemical Co., is now associated with the Hazard Advertising Corporation, No. 7 East 42nd street, New York City. Mr. McKerrow's long experience in the textile business, together with his acquaintance with advertising generally, will enable the agency to handle textile and dyestuff accounts with a complete understanding of mill processes and methods.

COMPANY NEWS.

Imperial Oil Company, Limited.—That 1922 had been a thoroughly satisfactory period for the Imperial Oil Company was the statement of President C. O. Stillman at the annual meeting at Toronto, Feb. 22nd. Mr. Stillman pointed out that, through its subsidiary, the International Petroleum Company, the Imperial is in receipt of considerable income from operations in South America. Bulk shipments for International petroleum and Imperial oil in 1922 amounted to 13,939,627 barrels, as against 11,095,788 barrels in 1921.

Changing conditions in the sources of supply of crude petroleum and the consumption of petroleum products in the Canadian West had necessitated the construction of a refinery at Calgary, which it is expected will be in operation towards the close of 1923.

Referring to the prospecting for oil at Fort Norman, in the North-West, Mr. Stillman pointed out that, although the third year of active drilling operations had ended without tangible result, and though the large expenditure of capital in the North-West had so far proved unproductive, yet the company considered that the search for oil in the North-West regions was a quest not yet without hope of success.

The latest reports to reach the Imperial head office from Fort Norman state that conditions are now favorable to having possibly two wells completed by the opening of navigation on the Mackenzie River. The Bear Island well is now down 515 feet, with 10-inch casing to the bottom, and a one-day test at the Discovery well showed production running about one hundred barrels.

Canadian Salt Company—Canadian Salt Company reports a satisfactory improvement in earnings in its annual statement for the year ending December 31st last. Gross profits for the year's operations were $284,915 as compared with $228,040 for the preceding year. Appropriations were as follows: Interest on mortgage bonds, $55,928; expenses, $533; income tax for 1921, $13,634, and for sinking fund, $10,000. In addition, $40,406 was reserved for depreciation, $18,500 for 1922 income tax, $2,000 for bad debts, $2,750 written off patent rights, and $3,700 written off discount on general mortgage bonds sold. After paying dividends, there remained $41,640 to be added to surplus, and bringing that account up to $249,823.

The balance sheet shows assets valued at $2,545,812, as compared with $2,415,812.

TRADE LITERATURE.

"Chemical Terms Explained"—Gascoyne & Company, Baltimore, Maryland; a 32-page booklet recently gotten out by this well-known firm of consulting chemists. The booklet deals chiefly with the fertilizer industry and the chemicals and materials used in preparing fertilizers, fats and oils. The booklet is a worthwhile compilation and contains among other things a handy table of analysis of feeding stuffs.

"Optical Methods," Volume 1.; Adam Hilger, Ltd., London, England. Price 1s. 8d.

This is a second edition, covering in detail spectrum analysis, absorption spectra, refractometry and polarimetry. A very excellent and well-illustrated little book.

"Notes on Technical Ore Analysis," by A. H. Low. John Wiley & Sons, Inc., New York. Price, $1.75.

This very successful teacher and analysist gives to others, in this book, his detailed methods, principally of the volumetric type.

"Where to Buy (Everything Chemical)."—For anyone desiring to have a directory of the principal sources of chemicals and chemical equipment in the United Kingdom this semi-annual publication "fills the bill" very well indeed. It is divided into three sections: General Chemicals, Fine Chemicals, Plant, Material and Apparatus, concluding with an index to trade names. Chemicals and equipment are listed in alphabetical order with the names of manufacturers under each, giving their address, telephone and telegraphic address. It is published in January and July of each year and kept up-to-date. Price, 2 shillings 6 pence, post free. The Technical Editor is C. J. Goodwin, B.Sc., and the publishers are S. Davis & Co., 30 St. Swithin's Lane, London, E.C. 4.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

Note.—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Granulating Cyanide.—G. L. Des Ylouses, 227,478, Dec. 26, 1922.

Absorbing Gases in Liquids.—R. B. Wolf, 227,606, Jan. 2, 1923. In the absorption of gases, i.e., production of acid sulfite liquor, the gases are brought into contact with the liquor by counter-current circulation, the resulting liquor is drawn off and brought in intimate contact with strong gases in a blower which is protected from corrosive action of the gas by the pressure of the liquor. Apparatus is also specified.

Acetylene Tanks.—F. J. Metzger, 227,608, Jan. 2, 1923. A storage tank for C_2H_2 contains Balsa wood in a finely-divided state, and a solvent for the gas.

Soluble Condensation Products of Naphthalene Formaldehyde and Sulphuric Acid.—O. Schmidt, 227,609, Jan. 2, 1923. Naphthalene and H_2SO_4 are heated at about 140° to form Beta-$C_{10}H_7SO_3H$, and when the product is cooled to 80-90° CH_2O is gradually added while the temperature is kept at 60-100°. The mass thickens and water is added to facilitate stirring, which is continued until CH_2O odor is eliminated. On cooling the material solidifies to a resinous slightly colored mass easily soluble in cold H_2O. When the solution is neutralized with an alkali the products are still soluble. The solution is suitable for use in rendering soluble the difficultly soluble portion of quebracho extract used in tanning. It may be used as a tanning agent itself.

Formaldehyde.—G. C. Bailey and A. E. Craver, 228,038, Jan. 16, 1923. MeOH in the vapor phase and an O containing gas are brought into contact with an oxide of vanadium as catalyst heated to about 275°.

Purification of Phenol-contaminated Liquors.—R. L. Brown, 228,057, Jan. 16, 1923. Waste NH_3 still liquor is purified by continuously passing the diluted liquor through a filter containing humus material holding phenol-destroying micro-organisms, the dilution and rate of flow being such that a micro-organic reproduction is permitted which substantially offsets the micro-organic wastage.

Preparation of Liquid Bleach Solution.—J. H. MacMahon, 228,059, Jan. 16, 1923. In the treatment of alkaline solutions with Cl. the Cl. is supplied in liquid form and the heat of vaporization of the Cl. is used to cool the alkaline solution, the Cl. being vaporized by indirect contact with the solution and then being introduced in gaseous form into the solution.

Manufacture of Bleaching Powder Solutions.—J. H. MacMahon, 228,060, Jan. 16, 1923. A bleaching powder of stable character, substantially free from excess lime and from any markedly alkaline reaction is prepared by mixing bleaching powder containing an excess of lime with water and treating the mixture with Cl.

Non-oxidizing Refrigerant Gas. — F. W. Robison, 228,082. Jan. 16, 1923. SO_2 containing CO_2 in quantity sufficient to counteract the oxidizing effect of the SO_2, but not sufficient to materially alter the pressure at which the mixture liquifies, is used as a refrigerant.

Melting Zinc in Electric Rotating Furnaces. C. E. Cornelius, 228,098, Jan. 16, 1923. Zn powder is converted to liquid form by con-

tinuously introducing the powder in a rotating furnace so as to subject the charge to a rubbing action to separate the free liquefied content and continuously discharging the residue from the furnace. Apparatus is also specified.

Production of Zinc.—C. E. Cornelius, 228,099, Jan. 16, 1923. The zn ore is given a preliminary heat treatment to drive off moisture, before the extraction step begins, in an electric furnace in which the charge is agitated.

Extracting Copper From Its Ores.—P. W. Nevill and H. Soanes, 228,117, Jan. 16, 1923.

Aldehydes and Anhydrides From Diesters.—F. W. Skirrow, 228,126, Jan. 16, 1923. A diester is heated to above 100° in the presence of an oxide of S, the vaporous products of the reaction are condensed at 40-60°, the condensate is returned to the reaction and the uncondensed vapors are separately collected and excluded. AcH and $(Ch_3CO)_2O$ may thus be prepared from ethylidene diacetate.

Diesters From Vinyl Esters.—F. W. Skirrow and J. Dick, 228,127, Jan. 16, 1923. A vinyl ester and the corresponding carboxylic acid are heated in the presence of a catalyst to the temperature of ebullition of the mixture. Ethylidene diacetate is thus prepared from vinyl acetate and AcOH with an oxide of S as catalyst at 120°.

Manufacture of Alkali Metal Cyanides.—F. J. Metzger, 228 238, Jan. 23, 1923.

Furnace Tubes.—F. J. Metzger, 228,239, Jan. 23, 1923.

Phosphoric Acid.—A. Kelly, 228,247, Jan. 23, 1923.

Recovering Litharge From Sugar Residues.—A. S. Ramage, 228,284. Jan. 23, 1923. Sugar residues containing $PbCO_3$ and Ph nonsugars are subjected to a gradually increased controlled temperature and to a reverse flow of a current of air whose O content is gradually reduced, the Ph content being thus first reduced to metallic Ph, which is gradually oxidized under increasing temperature and increasing oxidizing conditions to litharge.

Production of Refractory Metal Alloys.—B. D. Saklawalla and A. N. Anderson, 228,287, Jan. 23. 1923.

Hydro Cyanic Acid.—F. J. Metzger, 288.392, Jan. 30, 1923.

Production of Cyanides.—F. J. Metzger, 228,393, Jan. 30, 1923.

Butyladehyde and Butylalcohol From Crotonaldehyde.—N. Grunstein, 228,438, Jan. 30. 1923. Crotonicaldehyde is treated with H. in the presence of water to produce BuH and Bualc, the water used being preferahly that contained in the product of hydration.

Condensation Products of Aliphatic Aldehydes.—H. W. Matheson, 228,441, Jan. 30, 1923. Less than 10% of its weight of a caustic alkali in aqueous solution is slowly added to an aldehyde at a temperature helow 20°. The temperature is maintained for 12-24 hours. The alkali is then neutralized and the condensation product separated by distillation.

Process for Making Electrodes.—William G. Michel, 228,442. Jan. 30, 1923.

Filter Presses.—H. Plauson, 228,443, Jan. 30, 1923.

Elastic Cement.—W. T. Goddard, 227,950, Jan. 16, 1923. A cement compound contains cement and a non-friable aggregate, part of which is initially coated with rubber.

Tanning Process.—O. Schmidt, 228,241, Jan. 23, 1923. Skins are treated with a solution of a product from naphthalene, H_2SO_4 and HCOH. The product is of amorphous character is soluble in water, is free from phenolic hydroxyl and quinone groups and dyeing properties, and will precipitate glue or gelatin.

Soluble Tanning Agent.—O. Schmidt, 228,242, Jan. 23. 1923. A difficultly soluble tanning agent is made more soluble by treating it with a product obtained from naphthalene 10, H_2SO_4 10, and HCOH 4.3 parts.

Tanning Composition.—C. Immerheiser and Hugo Wolff, 228,246, Jan. 23, 1923.

Gaseous Fuel.—J. R. Rose and J. Harris, 227,511 to 227,529, Jan. 2, 1923. A fuel for cutting, welding and heating contains a mixture of CH_4 and C_3H_8, 2½% each by volume and 12½% H. In No. 227,512 illuminating gas replaces C_3H_8. In No. 227,513 illuminating gas, C_2H_4 and H are mixed in the above proportions. In No. 227,514 C_3H_8 replaces the illuminating gas of the prior patent. In No. 227,515 CH_4 is mixed with C_2H_4 and H. In No. 227,516 by-product coke-oven gas is mixed with CH_4 and H. In No. 227,517 H is mixed with 5-25% by volume of C_3H_8. In No. 227,518 illuminating gas, CO and H are mixed in the first-mentioned proportions. In No. 227,519 by-product coke-oven gas C_2H_4 and H are mixed. In No. 227,520 by-product coke-oven gas C_3H_8 and H are mixed. In No. 227,521 the mixture consists of C_4H_{10}, CO and H. In No. 227,522 CO, C_3H_8 and H are mixed. In No. 227,523 the mixture consists of H with 5-25% C_4H_{10}. In No. 227,524 the mixture is CH_4, CO and H. In No. 227,525 by-product coke-oven gas is mixed with C_4H_{10} and H. In No. 227,526 H is mixed with 5-25% by volume of C_2H_4. In No. 227,527 C_4H_{10}, C_3H_8 and H are mixed. In No. 227,528 the mixture consists of CH_4, C_3H_{10} and H. In No. 227,529, C_3H_{10}, C_2H_4 and H are mixed.

Gaseous Fuel.—John Harris, 227,530-533, Jan. 2, 1923. H 95-50% is mixed with artificial illuminating gas 5-50%. In No. 227,531 carburated water gas replaces the illuminating gas of the prior patent. In No. 227,532 CO is mixed with H in the above preparations. In No. 227,533 H and C_2H_4 are mixed.

Gaseous Fuel.—J. R. Rose, 227,534, Jan. 2, 1923. A gaseous mixture for cutting and welding contains H with CH_4 5-20%.

Chemical Oil and Metal Market

CHEMICALS.

Business in chemicals continued good throughout February, though there were no spectacular developments. Dealers both at Montreal and Toronto reported a rather quiet trend to the market during the last half of the month. But despite this slight falling off in demand, prices remained very firm, and with a turn again for the hetter during the first week of March, quotations on several industrial chemicals have advanced. Analyzing the situation as of date, March 8th, it would appear that trade in heavy chemicals is "good" with prices steady, but, tending to advance: while business in the fine chemicals and pharmaceuticals is very brisk, with many lines sharply advanced.

Particular activity is noted in fertilizer materials. Acid phosphate has advanced over $5.00 per ton, quotations now running from $28.00 to $30.00 per ton. Nitrate of Soda and Sulphate of Ammonia are both stronger, the former at $70.00 per ton and the latter at $68.00 to $70.00 per ton.

Advanced copper prices are responsible for higher quotations on copper sulphate. Calcium Chloride is stronger, the fused advancing from $25.00 to $31.00 per ton, and the flake from $43.00 to $48.00.

Supplies of Yellow Prussiate of Soda are scanty and prices have again advanced three cents per pound.

Lead free zinc oxide is advanced with a keen demand prevailing. None can be bought under 10 cents, while the prices for ordinary amounts run from 11 to 12 cents per pound.

No change is recorded in any of the heavy acids, sulphuric, hydrochloric or nitric. Buying continues steady with firm prices. In this connection a very obvious mistake occurred in this review last month, when, due to a typographical error, "hydrochloric 60%" and "30%" was referred to as advanced. This should have been "hydrofluoric."

Advances: The following have advanced the amount stated: Barium Chloride, 1 cent lb.; Barium Peroxide, 3 cents lb.; Calcium Chloride, $5.00 ton; Carbon Bisulphide, 1 cent lb.; Ferric Chloride, Crystals, 2 cents lb.; Iodine, crude, ¼ cent lb.; Magnesium Carbonate, 2 cents lb.; Yellow Prussiate, potash, 3 cents lb.; Potassium Carbonate, 2 cents lb.; Sodium Cyanide, 2 cents lb.; Zinc Sulphate, 1 cent lb.; Zinc Oxide, 1 cent lb.; Zinc Steareate, 5 cents lb.; Oleic Acid, 5 cents lb.; Stearic Acid, 2 cents lb.

Declines: The following have declined the amount stated: Borax, crystals, ¼ cent lb.; Whiting, $1 ton; Amyl Acetate, 25 cents gal.; Citric Acid, 5 cents lb.

Glycerine—All gardes of Glycerine are in good demand and quotations are holding steady.

Gums and Waxes—Trade in these lines is very good at present. There is keen competition, with some dealers doing business on very small margin. Prices, nevertheless, are firm and nearly all the large gum and wax importers at New York predict stronger prices.

Essential Oils—Following a rather quiet period, business has again improved in Essential Oils. A feature of the past month has been the strong position of Peppermint Oils. prices having advanced over a dollar per pound since New Years on the B. P. and American grades.

Petroleum Oils—Both Pennsylvania and Mid-Continent Crude Oils have advanced sharply, the former showing an increase of a dollar per gallon since February 1st, and the latter of 60 cents per gallon. Fuel Oil is also stronger and in good demand, prices at Toronto on March 8th, being 11 cents per gallon in barrels, and 9 cents per gallon in tank cars. a jump of 1 cent per gallon since February 1st.

METALS.

The strong position of lead and zinc continues. Both these metals are in excellent demand. Lead has advanced 40 cents per cwt., since February 1st, and is now quoted at $7.85 per cwt., at Toronto, in car lots. Zinc shows even a greater rise, an increase of 80 cents per cwt., over February 1st quotations. The better position of copper has featured the metal market during February, an advance of over a dollar per cwt. occurring.

But increasing strength is not confined to lead and zinc. In fact all the industrial metals are advanced and business has improved considerably in all of them, particularly steel and tin. Buyers are experiencing no little difficulty in securing certain kinds of structural steel shapes from American mills, while Canadian steel plants are well employed. Galvanized sheets show an advance of 50 cents per cwt., and sheet steel has risen an average of 25 cents per cwt.

Manufacturers and distributors of Aluminium are very busy and buyers who have remained out of the market now find difficulty in getting delivery and in any case have now to pay the advanced prices. The 98-99% Aluminium 15-ton lots or over, has advanced over 4 cents per lh. since Feb. 1st.

Tin is stronger by nearly 10 cents per lb., prevailing quotations being from 50 to 54 cents per lb., depending on quantity.

'See quotations on pages 80 and 81 on Chemicals, Oils, Gums, etc., and Metals.)

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals and Industrial Minerals.

Inorganic.

Alum, Ammonia, lump or ground	100 Lbs.	4.50— 5.00
Ammonium Bromide	Lb.	.. — .28
Aluminum Sulphate, lump, bags	Cwt.	2.25— 2.50
Aluminum Sulphate, ground, bags	Cwt.	2.50— 2.75
Aluminium Sulphate, iron free	Cwt.	.. — 4.00
Ammonia, Aqua, 26, Carboys	Lb.	.13— .14
Ammonia, Aqua, 26, Drums	Lb.	.. —.09½
Ammonium Carbonate	Lb.	.12— .15
Ammonium Chloride	Lb.	.10— .13
Ammonia Iodide	Lb.	.. — 6.25
Arsenic	Lb	.10— .12
Barium Sulphate (Barytes)	Per Ton	30.00—35.00
Barium Chloride	Lb.	.06— .08
Barium Nitrate	Lb.	.. — .16
Barium Peroxide	Lb	.. — .26
Barium Sulphate, B.P.	Per Ton	60.00—60.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	Lb.	2.50— 3.00
Borax, crystals	Lb.	.06¾— .07
Boric Acid	Lb.	.. — .13
Bromine (technical)	Lb.	.. — .38
Calcium Acid Phosphate	Lb.	.. —.07½
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —95.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	..—100.00
Calcium Chloride, fused	Per Ton	.. —31.00
Calcium Chloride, flake	Ton	44.00—48.00
Caustic Soda, flake, drums	Cwt.	5.00— 5.50
Caustic Soda, ground, drum	Cwt.	5.00— 5.50
Caustic Soda, solid, drum	Cwt.	4.25— 4.75
Camphor Monobromate	Lb	.. — 3.00
Carbon Bisulphide, in drums	Lb.	.12— .13
Carbon Tetrachloride, drums	Lb.	.. — .15
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, Canadian, f.o.b. Huberdeau, Que., car lots	Ton	17.00—18.00
China Clay, imported	Per Ton	20.00—25.00
Cobalt Oxide, black	Lb.	.. — 2.00
Cobalt Oxide, grey	Lb	.. — 2.25
Copperas (Iron Sulphate) crystals	Lb.	.02—.02¼
Copperas (Iron Sulphate) sugar	Lb.	.02—.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.08—.08¼
Corrosive Sublimate (Mercuric Chloride)	Lb.	1.15— 1.20
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	.. —30.00
Ferric Chloride, crystals	Lb.	.13— .14
Ferric Chloride, solution	Lb.	.. — .10
Hydrofluoric Acid, 60%	Lb.	.22— .25
Hydrofluoric Acid. 30%	Lb.	.11— .13
Hydrochloric Acid, carboys, 18	100 Lbs.	2.25— 2.75
Hydrogen Peroxide	Gal.	.70— .75
Iodine, crude	Lb.	4.50— 4.75
Iodine, resublimed	Lb.	5.50— 5.60
Iron Oxide (red)	Lb	.05— .13
Lead Acetate	Lb.	.14— .16
Lead Nitrate	Lb.	.14 — .15
Lime, grey	Ton	.. —14.30
Lime, grey, in car lots	Ton	.. —11.70
Lime (hydrated) in ton lots	Ton	.. —20.00
Litharge	Lb.	.09— .10
Litbium Carbonate	Lb.	1.80— 2.10
Lithopone	Lb.	.. —.07½
Magnesite, calcined	Per Ton	.. —30.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bhl.	Lb.	.14— .16
Magnesium Sulphate	Lb.	.03½—.04½
Mag. Sulphate, B.P., Medicinal	Single Ton	60.00—70.00
Mag. Sulphate, Technical, car lots	Ton	45.00—50.00
Mica, ground, f.o.b. Hull, Que.	Ton	.. —60.00
Muriatic Acid, 18	100 Lbs.	2.25— 2.75
Nickel Salt, single, in bbl. lots	Lb.	.. —.13½
Nickel Salt, single, per cwt.	Lb.	.. — .15
Nickel Salt, double, barrel lots	Lb	.. — .14
Nickel Salt, double, per cwt.	Lb.	.. —.15½
Nitric Acid, 36 carboys	100 Lbs.	8.75— 9.00
Phosphoric Acid, 85%	Lb.	.. — .28
Phosphoric Acid, 50%	Lb.	.. — .22
Phosphorus, yellow	Lb.	.. — .34
Potash Prussiate, yellow	Lb.	.32— .34
Potassium Bicarbonate	Lb.	.. — .20
Potassium Bromide, crystals	Lb.	.28— .34
Potassium Bromide, granular	Lb.	.28— .34
Potassium Bichromate	Lb.	.17— .18
Potassium Carbonate, calc. 80%-85%	Lb.	.. — .11
Potassium Chlorate	Lb.	.. — .10
Potassium Citrate	Lb.	.90— 1.00
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .45
Potassium Hydroxide (caustic potash) small drums	Lb.	.10— .15
Potassium Hydroxide (caustic potash) large drums	Lb.	.09— .10
Potassium Iodide	Lb	.. — 4.40
Potassium Nitrate, casks	Lb.	.10— .12
Potassium Permanganate, bulk	Lb.	.19— .20
Red Precipitate (Mercuric Oxide)	Lb.	.. — 1.75
Silver Nitrate	Lb.	.. — 9.00
Soda Ash, bags	Cwt.	2.25— 2.40
Sodium Acetate, ton lots or over	Lb.	.. — .08
Sodium Acetate, lesser amounts	Lb.	.. —.08½
Sodium Aluminium Phosphate	Lb.	.. —.03½
Sodium Benzoate	Lb.	.60— .85
Sodium Bicarbonate, 100% pure	Lb.	2.50— 3.00
Sodium Bichromate, bbls	Lb.	.10— .13
Sodium Bisulphite, powder	Lb.	.05¼— .06
Sodium Bisulphite, 35 Be	Lb.	.03—.03¼
Sodium Bromide (foreign)	Lb.	.. — .28
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. — .34
Sodium Fluoride, 95-98%	Lb.	.15— .16
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.00
Sodium Hyposulphite, barrels	Cwt.	4.00— 4.50
Sodium Iodide	Lb.	.. — 4.90
Sodium Nitrate, refined	Cwt.	6.75— 7.00
Sodium Nitrate, crude, 95%	Cwt.	5.25— 5.75
Sodium Nitrite	Lb	.12— .15
Sodium Perborate, U.S.P.	Lb.	.35— .40
Sodium Peroxide, f.o.b. New York	Lb.	.30— .35
Sodium Silicate, 42°, car lots	Cwt.	.. — 1.35
Sodium Silicate, 42°, smaller lots	Cwt.	.. — 1.55
Sodium Silicate, 40°, car lots	Cwt.	.. — 1.25
Sodium Silicate, 40°, smaller lots	Cwt.	.. — 1.45
Sodium Sulphide, 60-62% fused	Lb.	.08— .09
Sodium Sulphate (Glauber's Salts) crystals,	Per Cwt. in Bags	1.80— 2.00
	Per Cwt. in Car Lots	1.65— 1.70
Sodium Sulphite	Lb.	.. — .05
Sodium Prussiate, Yellow	Lb	.24— .25
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.25— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.25— 2.75
Sulphuric Acid, 66 Be, tank cars, f.o.b. Toronto,	Ton	23.75—24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —23.00
Tin Chloride crystals	Lb.	.30— .35
Tri-sodium Phosphate	Lb.	.07—.07½
Ultramarine, Blue	Lb.	.10— .29
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 1.85
Whiting (English)	Ton	.. —30.00
Whiting (American)	Ton	.. —28.00
Zinc Sulphate, com.	Lb.	.05—.05½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.11— .12
Zinc Stearerate	Lb.	.30— .35

Organic.

Acetanilid, C. P.	Lb.	.45— .50
Acetic Acid, glacial, barrels, f.o.b. Shawinigan Falls.	Lb.	.. — .12
Acetic Acid, glacial, carboys, f.o.h. Shawinigan Falls,	Lb.	.. —.12½
Acetic Acid, glacial, bbls., car lots, fo.b. Shawinigan,	Lb.	.. — .16
Acetic Acid, 28%, carload lots	100 Lb.	.. — 4.80
Acetic Acid, 28%, 25 bbl. lots	100 Lb	.. — 5.05
Acetic Acid, 28%, 10 hbl. lots	100 Lh.	.. — 5.30
Acetic Acid, 28%, 5 bbl. lots	100 Lb.	.. — 5.55
Acetic Acid, 28%, 1 or 2 bhl. lots	100 Lh.	.. — 5.80
Acetic Acid, 80%, carload lots	100 Lb.	.. —13.20
Acetic Acid, 80%, 25 hbl. lots	100 Lb.	.. —15.20
Acetic Acid, 80%, 15 hhl. lots	100 Lb.	.. —16.20
Acetic Acid, 80%, 10 hhl. lots	100 Lb.	.. —16.75
Acetic Acid, 80%, 5 bbl. lots	100 Lh.	.. —17.20
Acetic Acid, 80%, 3 or 4 bhl. lots	100 Lb.	.. —18.20
Acetic Acid, 80%, 1 or 2 bhl. lots	100 Lb.	.. —18.50
Acetone, pure, drums or over	Lb.	.. — .27
Acetone, pure, lesser amounts	Lb.	.. — .34
Aspirin, in 100-lh. lots, hulk	Lb.	.75— .95
Alcohol, Absolute Ethyl, case of 1 doz.	1-lh. bottle	.. — 3.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —23.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.15
Alcohol, acetone, lesser amounts	Gal.	.. — 1.45
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.20
Alcohol, wood, 97%, half bbl. lots	Gal.	.. — 1.35
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 1.50
Aldehyde Ammonia	Lb.	.. — .75
Amyl acetate, technical	Gal.	.. — 4.00
Amyl Acetate, pure	Lb.	.. — .80
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.85 — .90
Caffeine, English	Lb.	.. — 3.50
Calomel (Mercurous Chloride)	Lb.	1.50— 1.60
Camphor, refined, slabs	Lb.	.. — 1.28
Camphor, refined, tah	Lb.	.. — 1.32
Carholic Acid, white crystals	Lb.	.35— .38
Chloroform	Lb.	.45— .55
Citric Acid, domestic, crystals	Lb.	.45— .55
Coumarin	Lb.	3.00— 3.50
Cream Tartar, 98%	Lb.	.25— .30
Dextrine, potato	Lb.	.. — .06
Dextrine, corn	Lb.	.. —.08½
Ether, B.P. (conc.)	Lb.	.. — .55
Ether, Sulphuric	Lb.	.30— .35
Formaldehyde, bbls. or over	Lb.	.. —.19½
Formaldehyde, 200-lb. kegs	Lb	.. —.24½
Formaldehyde, 100-lb. kegs	Lb.	.. —.25½
Formaldehyde, 50-lb. kegs	Lb.	.. —.26½
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special, refined	Gal.	4.00— 4.50
Gallic Acid	Lb.	1.25— 1.75
Glycerine, crude, drums	Lb.	.. — .15
Glycerine, crude, single tin of 56 lbs.	Lb.	.. — .17
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .29
Glycerine, C.P., two or more tins	Lb.	.. — .27
Glycerine, (pale straw), single tin 56 lbs.	Lb.	.. — .28
Glycertine, (pale straw), two or more tins	Lb.	.. — .26

Glycerine, C.P. drums, 500-1,000 lbs.	Lb.	.. — .21
Glycerine, pale straw, drums, 500-1,000 lbs.	Lb.	.. — .20
Hexamethylenetetramine		.. — .85
Oxalic Acid	Lb.	.18— .20
Oleic Acid	Lb.	.. — .26
Phenacetin	Lb.	1.75— 2.00
Phenolphthalein	Lb.	.. — 1.50
Pyrogallic Acid	Lb.	2.00— 2.10
Quinine	Oz.	.70— .75
Saccharin	Lb.	1.75— 2.25
Salicylic Acid	Lb.	.. — .50
Starch, corn, ground, car lots	Lb.	.. —.04¼
Starch, potato, ground, car lots	Lb.	.. —.08½
Stearic Acid, Double Pressed	Lb.	.22— .24
Stearic Acid, Triple Pressed	Lb.	.25— .27
Tartaric Acid, crystals or powdered	Lb.	.. — .38
Tannic Acid, commercial	Lb.	.45— .65

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .22
Hydrochloric Acid, C.P.	Lb.	.. — .14
Nitric Acid, C.P.	Lb.	.. — .22
Sulphuric Acid, C.P.	Lb.	.. — .13

Industrial Gases.

Acetylene, cylinders	per 100 cu. ft.	2.55— 3.00
Coal Gas, cylinders	per 100 cu. ft.	3.00— 4.00
Hydrogen, cylinders	per 100 cu. ft.	1.50— 2.00
Nitrogen, cylinders	per 100 cu. ft.	2.00— 3.00
Oxygen, cylinders	per 100 cu. ft.	1.50— 2.00

Fertilizer Materials.

Acid Phosphate	Ton	28.00—30.00
Animal Tankage, per unit of Ammonia		.. — 3.50
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda		65.00—70.00
Muriate of Potash	Ton	.. —40.00
Pure Ground Blood, per unit of Ammonia		.. — 4.00
Steamed Bone Meal	Per Ton	.. —30.00
Sulphate of Ammonia	Ton	68.00—70.00

Tanning and Dyeing Material

Fustic Crystals	Lb.	.26— .30
Hematine Crystals	Lb.	.18— .22
Logwood, Solid	Lb.	.18— .22
Quercitron Liquid Extract	Lb.	.07— .08
Liquid Sumac Extract	Lb.	.08— .09
Ground Sumac	Ton	65.00—70.00
Chestnut Liquid Extract	Lb.	.02½—.03½
Hemlock Liquid Extract	Lb.	.03½— .04
Quebracho Liquid Extract	Lb	.03—.03½
Quebracho Solid Extract	Lb.	.04¾—.05½

Essential and Vegetable Oils, Gums, Waxes

Essential Oils—

Anise Oil	Lb.	.. — .80
Cedar, leaf	Lb.	1.90— 2.00
Cedar, wood	Lb.	.. — .80
Camphor	Gal	.. — 1.10
Camphor, white	Lb.	.90— 1.10
Peppermint, American	Lb.	4.00— 4.25
Peppermint, re-distilled, B.P.	Lb.	4.00— 4.25
Peppermint, Japanese	Lb.	1.75— 2.00

Vegetable Oils—

Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.15— .17
Corn Oil, in bbls.	Lb.	.. — .12
Corn Oil, tank cars	Lb.	.10—.10½
Cottonseed Oil, crude, f.o.b. U. S. mills, tanks	lb.	.10— .10
Summer yellow, bbl.	lb.	.12—.12¼
Winter yellow, bbl.	lb	.13—.13¼
Linseed Oil, 1 to 2 bbls., Raw, per gal. of 9 lbs.		.. — 1.25
3 to 5 bbls., Raw, per gal. of 9 lbs		.. — 1.24
6 to 9 bbls., Raw, per gal. of 9 lbs		.. — 1.22
Linseed Oil, boiled, 3c per lb. higher than raw		
Monopole Oil	Lb.	.07— .16
Olive Oil, foots, at Toronto	Lb.	.12— .14

Gums—

Indian, No. 1A	Lb.	.. — .28
Indian, No. 1	Lb.	.. — .25
Tragacanth, No. 1, Ribbon	Lb.	.. — 3.00
Tragacanth, No. 1, Flake	Lb.	.. — 2.00
Tragacanth, Turkey	Lb.	.. — 2.00
Arabic, clear amber sorts	Lb.	.. — .22
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .30
Arabic, regular grain No. 2	Lb.	.. — .31
Arabic, white sorts	Lb.	.. — .35
Arabic, powdered, No. 1	Lb.	.. — .40
Arabic, powdered, No. 2	Lb.	.. — .39

Waxes—

Paraffin, 128°—130°, M.P., 250 lb. lots	Lb.	.. — .06
Paraffin, 118°—120°, M.P., 250 lb. lots	Lb.	.. — .05
Parowax, blocks, 100 lb. lots	Lb.	.. —.08¾

Carnauba.

No. 1	Lb.	.. — .50
No. 2	Lb.	.. — .42
No. 3, Chalky	Lb.	.. — .21
North Country, No. 2	Lb	.. — .32
North Country, No. 3	Lb.	.. — .22

Ceresin.

White	Lb.	.. —.12¼
Yellow	Lb.	.. — .12
Montan	Lb.	.06— .07
Candelilla	Lb.	.40— .42
Japan	Lb.	.19— .20

Beeswax.

White, pure	Lb.	.. — .38
African, bags	Lb.	.. — .30
Brazilian	Lb.	.. — .34
Chilean	Lb.	.. — .35
Refined	Lb.	.. — .31

Shellacs.

T.N.	Lb.	.. — .90
Superfine Orange	Lb.	.83— .85
A. C. Garnet	Lb.	.. — .82
Bone Dry	Lb.	.. — .99

Crude Rubber.

The following quotations on Rubber are in American funds, New York delivery:—

Para, upriver fine	lb.	.33—.33½
upriver, coarse	lb.	.27½ .28
Caucho ball	lb.	29½ .30
Plantation, 1st latex crepe	lb.	.35½—.35¾
Ribbed smoked sheets	lb.	.35½—.35¾
Brown crepe, thin, clean	lb.	.31— .32
Amber crepe, No. 1	lb.	.31— .32

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .29
Motor Gasoline (service stations)	Gal.	.. — .33
Lighting Gasoline	Gal.	.. — .34
Naphtha	Gal.	.. — .28
Coal Oil	Gal.	.. — .21
Fuel Oil, bbls.	Gal.	.. — .11
Fuel Oil, tank cars	Gal.	.. — .09
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.85
Pennsylvania, Crude (42 W. gal.)	Bbl.	.. — 4.00
Crude Creosote Oil, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .60
Crude Coal Tar	Bbl.	.. —10.25
Refined Coal Tar	Bbl.	.. —11.50
Coal Tar Pitch, bbls.	Cwt.	.. — 2.00
Benzol, 100%	Imp. Gal.	.. — .65
Benzol, 90%	Imp. Gal.	.. — .60
Refined Solvent Naphtha	Gal.	.. — .48
Pure Toluol	Gal.	.. — .52
Dip Oil, 20 per cent. (at New York)	Gal.	.24— .26
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .30
Naphthalin flake	Lb.	.. — .08
Naphthalin balls	Lb.	.. — .09
Alpha-Naphylamin	Lb.	.. — .51

Flotation Oils and Naval Stores.

Rosin, Grade G, in 280-lb. bbl. lots		.. — 9.50
Rosin, Grade W. W., in 280-lb. bbl. lots		.. —11.50
Turpentine, 1 bbl. lots	per Imp. gal	.. — 2.25
2 to 4 bbl. lots	per Imp. gal.	.. — 2.24
5 gallon lots	per Imp. gal.	.. — 2.40

Metals.

Aluminium, 98-99%, 15 ton lots	Lb.	.. — .22
Antimony	Lb.	.. —.09¾
Brass, yellow ingots	Lb.	.. — .12
Brass, red	Lb.	.. —.16¼
Brass, rods	Lb.	.. — .19
Cobalt, metal	Lb.	3.00— 3.25
Copper, electrolytic, small lots	Cwt.	.. —19.25
Copper, electrolytic, car lots	Cwt.	.. —18.75
Copper, casting, small lots	Cwt.	.. —18.25
Copper, casting, car lots	Cwt.	.. —17.75
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —34.00
Lead, Pig, small lots	Cwt.	.. — 8.35
Lead, Pig, car lots	Cwt.	.. — 7.85
Magnesium, ribbon	Oz.	.. — 1.50
Magnesium, ribbon	Lb.	.. —18.00
Magnesium, powder	Oz.	.60— .65
Monel Metal, machined rods	Lb.	.. — .50
Monel Blocks	Lb.	.. — .34
Monel Metal, shot	Lb.	.. — .34
Monel Metal, sheet, hot rolled, on orders of over five hundred pounds, of one gauge	Lb.	.. — .48
Monel Metal, rods, hot rolled	Lb.	.. — .42
Monel Metal, rods, cold rolled	Lb.	.. — .53
Nickel, shot or ingot	Lb.	.. — .35
Platinum, pure	Oz.	..—124.00
Platinum, 5% iridium	Oz.	..—128.00
Platinum, 10% iridium	Oz.	..—138.00
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Silver, bar, Canadian produced, U.S. funds	Oz.	.. —.67¼
Steel, mild, ¼ inch, base price	Cwt.	.. — 3.35
Steel, mild, 3/16 inch, base price	Cwt.	.. — 3.85
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Steel, sheet, 28 gauge, size 30"	Cwt.	.. — 5.50
Steel, sheet, 28 gauge, size 36"	Cwt.	.. — 5.45
Steel, sheets, galvanized, 28 gauge, 30"	Cwt.	.. — 6.75
Steel, sheets, galvanized, 28 gauge, 36"	Cwt.	.. — 7.00
Tin	Lb.	.. — .54
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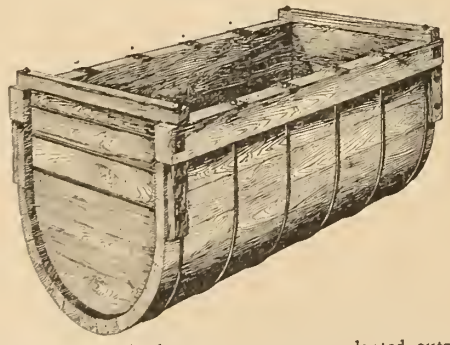

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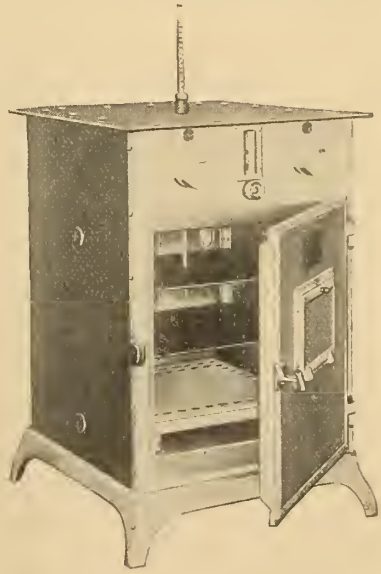

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BUYERS' GUIDE—Continued from page 46

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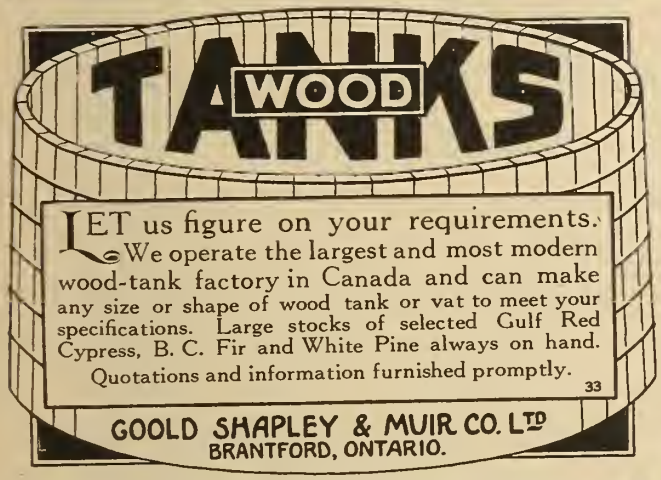

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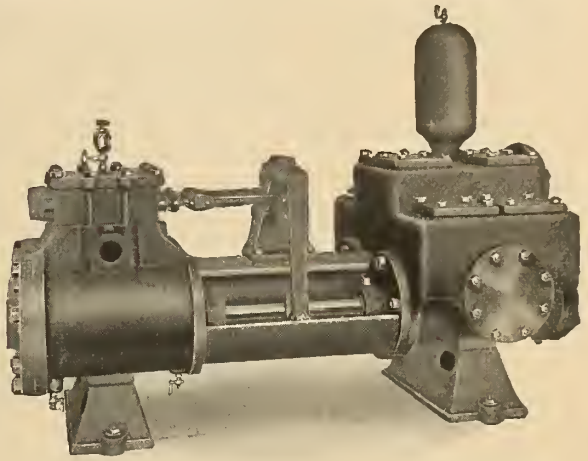

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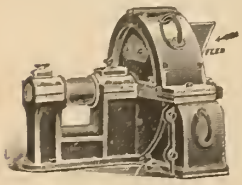

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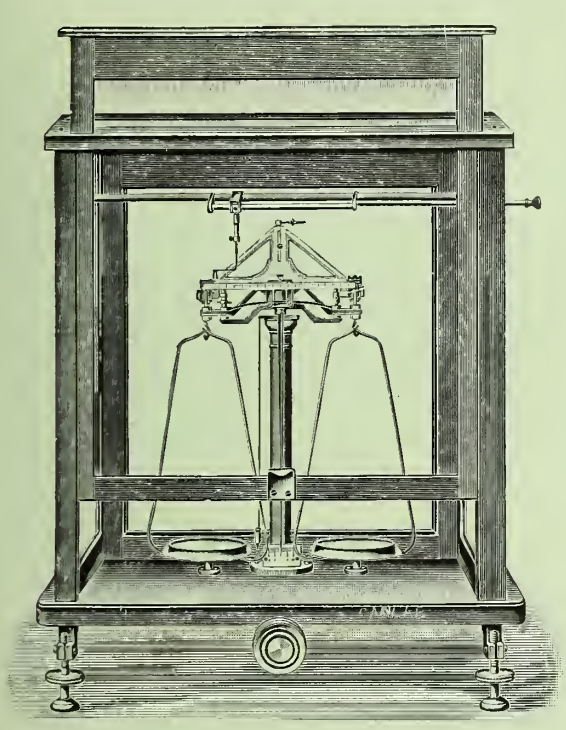

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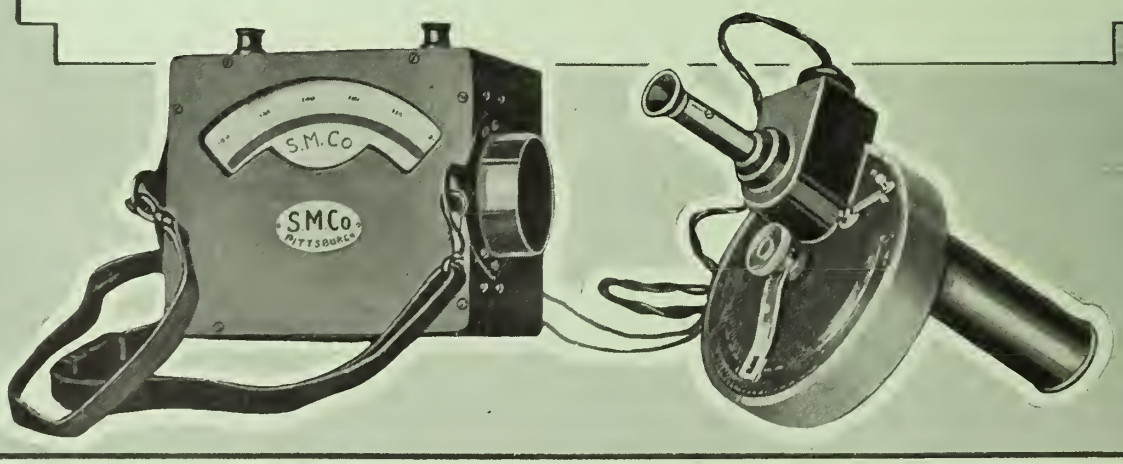

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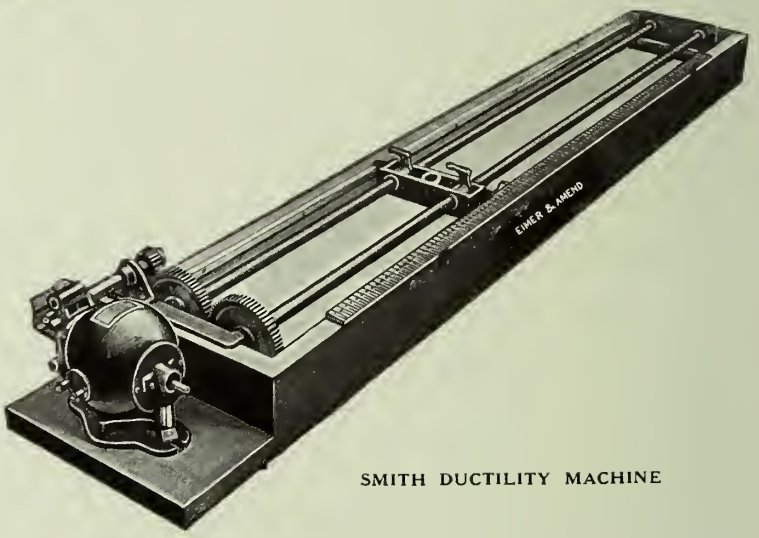

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TO END OF DECEMBER, 1922,

Has produced Minerals as follows: Placer Gold, $76,542,203; Lode Gold, $109,647,661; Silver, $59,814,266; Lead, $51,810,891; Copper, $170,723,242; Zinc, $24,625,853; Miscellaneous, Minerals, $1,358,839; Coal and Coke, $238,289,565; Building Stone, Brick, Cement, etc., $36,605,942, making its Mineral Production to the end of 1922 show an

Aggregate Value of $769,418,462

Production for Year Ending December, 1922, $35,158,843

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Preliminary Summary of Mineral Statistics

(Quantities represent shipments. Tons throughout are short tons of 2,000 pounds)

Product		1921 Quantity	1921 Value	1922 Quantity	1922 Value
METALLIC					
Gold	ounces	709,509	$14,624,085	$1,000,199	$20,674,109
Silver	"	8,412,059	5,497,160	9,167,846	6,491,271
Platinum metals (a)	"	915	51,060	642	38,884
Copper	lbs.	3,070,719	356,708	4,503,358	515,093
Nickel, metallic	"	5,430,147	1,825,359	11,175,326	3,171,434
Nickel, oxide	"	1,402,019	285,391	2,399,887	391,119
Cobalt, metallic	"	32,718	98,228	109,067	282,602
Cobalt, oxide	"	155,554	354,418	398,697	798,271
Other nickel and cobalt compounds and residues	"	108,814	114,069	1,070,935	255,034
Copper in matte exported (b)	tons	3,686	737,142	7,774	1,554,731
Nickel in matte exported (b)	"	4,850	1,939,851	8,689	3,475,649
Iron and briquettes (c)	"	100	459	4,304	25,261
Iron, pig (d)	"	82,838	2,079,729	14,052	340,730
Lead, pig	lbs.	3,570,222	190,843	2,895,695	173,742
Zinc (e)	"	.....	.....	100,283	2,181
Total metallic		.....	$27,574,202	.....	38,190,711
NON-METALLIC					
Actinolite	tons	78	$ 975	$ 50	$ 345
Apatite (Phosphate of Lime)	lbs.	.....	.....	31	248
Arsenic, white	"	2,982,525	233,763	4,118,695	299,940
Arsenate of Iron	"	.....	.....	75,000	938
Corundum	tons	402	50,250	.....	.....
Feldspar, crude and ground	"	15,506	114,059	15,515	94,985
Fluorspar	"	115	1,744	284	3,905
Graphite, crude and refined	"	363	23,273	626	34,124
Gypsum, crushed, ground and calcined	"	84,765	433,053	110,227	621,668
Iron Pyrites	"	19,375	91,604	11,235	39,763
Mica	"	222	29,630	2,229	56,480
Mineral water	Imp. gals.	.....	9,000	31,970	6,118
Natural gas	M. cu. ft.	8,590,000	2,953,000	7,919,390	3,902,800
Peat	tons	500	2,000	3,000	14,500
Petroleum	bbls.	172,859	466,716	164,732	439,286
Quartz and silica brick	tons	12,957	74,635	82,882	149,302
Salt	"	149,599	1,509,287	161,551	1,537,512
Talc, crude and ground	"	9,967	140,390	12,874	178,397
Construction Materials—($11,527,529)—					
Cement, Portland	bbls.	2,723,072	6,425,266	3,104,386	6,235,370
Lime	tons	91,355	1,172,680	116,769	1,315,479
Sand and gravel	cu. yds.	1,412,956	668,098	2,132,875	1,001,088
Sand-Lime brick	M.	.....	456,700	48,924	770,597
Stone, building, trap, granite		.....	1,812,863	.....	2,205,025
Clay Products—($5,103,618)					
Brick, common	M.	99,463	1,743,094	105,536	1,803,349
Brick, pressed	"	31,481	673,087	44,892	900,111
Brick, tapestry or rug	"			22,453	514,666
Tile, drain	"	9,910	250,040	10,110	260,312
Tile, building and floor		.....	211,529	.....	562,566
Pottery		.....	67,985	.....	88,889
Sewer pipe		.....	939,464	.....	973,824
Total non-metallic		.....	20,554,185	.....	24,011,458
Add metallic		.....	27,574,202	.....	38,190,711
Grand Total		.....	$48,128,387	.....	$62,202,169

(a) Recoveries from Canadian and United States refineries. (b) Copper and nickel exports in the form of matte were valued, respectively, at 10 and 20 cents per pound. (c) Exports and shipments to points other than Ontario blast furnaces. (d) Proportional product from Ontario ore smelted. (e) Recovery from concentrates shipped in 1919 and not previously reported.

Dividends and Bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies, or a total of $114,334,884.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

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Chromic Acid	Mixed Acid	Phthalic Acid	Tannic Acid
Citric Acid	Molybdic Acid	Picric Acid	Tartaric Acid
Formic Acid	Muriatic Acid		

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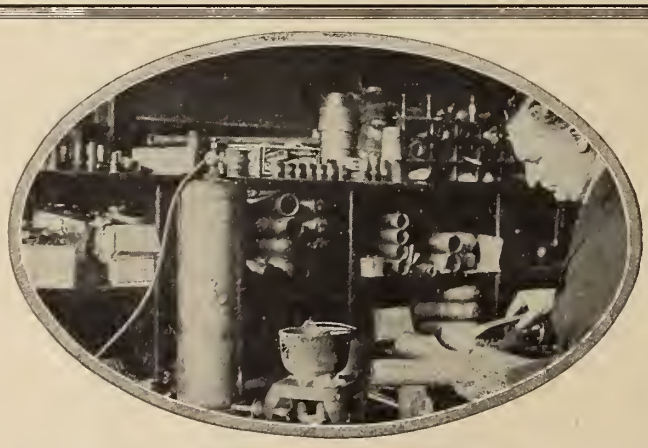

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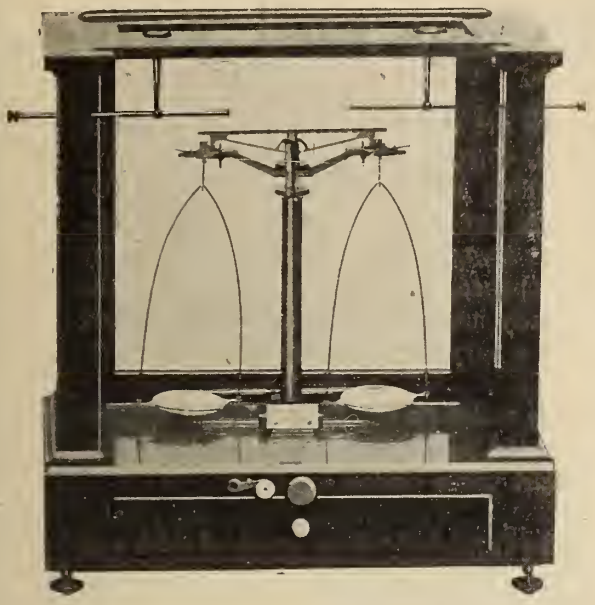

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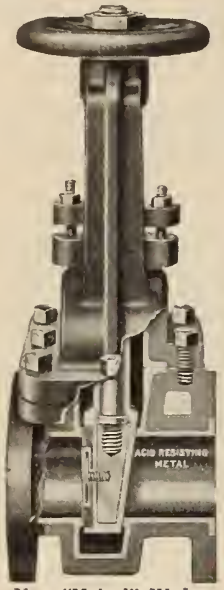

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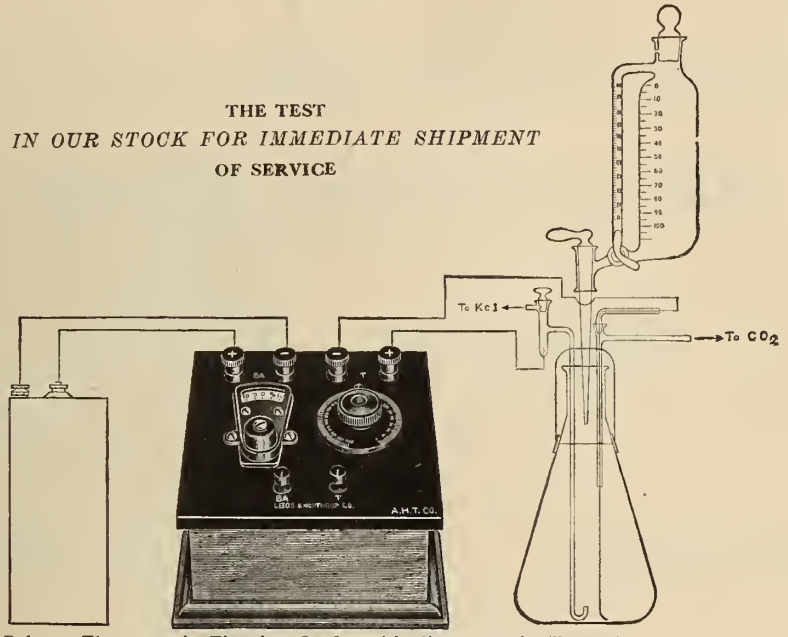

4914. Roberts Electrometric Titration Outfit, with diagrammatic illustration of connections between Titration Unit and accessories.

ROBERTS ELECTROMETRIC TITRATION UNIT, Leeds & Northrup, as originally designed for determining small amounts of ferrous oxide in the presence of much ferric oxide in the study of the oxides of iron at the Geophysical Laboratory (see Hostetter and Roberts, Journal of the American Chemical Society, XLI: 1337, 1919) but applicable to a wide range of electrometric titrations where the relative rather than the absolute values of the electromotive force developed during the titration are of significance.

While in this method the change of voltage at the end-point is so great under appropriate conditions that the unit can be nearly balanced at the beginning of the titration and the end-point located by the large permanent galvanometer deflection that accompanies this change, the end-point of the titration, in precise work, should be located by plotting the electromotive forces as ordinates against amounts of titrating solution as abscissæ. An arbitrary scale can, furthermore, be used for the slide wire with the zero so placed that the scale readings are always positive, although the electromotive force developed changes from negative to positive as the slider is moved along the scale.

This unit will be found generally useful in all electrometric titrations where the electromotive force developed at the electrodes of the titrating cell is to be balanced against a fall of potential along a slide wire and where arbitrary readings on the slide wire will answer the purpose. For precise work in the determination of ferric iron the Hostetter and Roberts Weighing Burette (see Journal of the American Chemical Society, XLI: 1350, 1919) is recommended for the dichromate solution. In this burette a small volume burette, 1 ml in 100ths, is used for the end-point, while the larger burette, 100 ml in 5 ml, is drawn upon for most of the titration.

For use in conjunction with this or other burette and the Electrometric Unit, the Hostetter and Roberts Titration Head (see Journal of the American Chemical Society, XLI: 1340, 1919) is recommended because the neck of the flask containing the solution to be titrated can be covered to protect the solution from atmospheric contact and made to serve at the same time as a support for both the calomel electrode and the platinum electrode.

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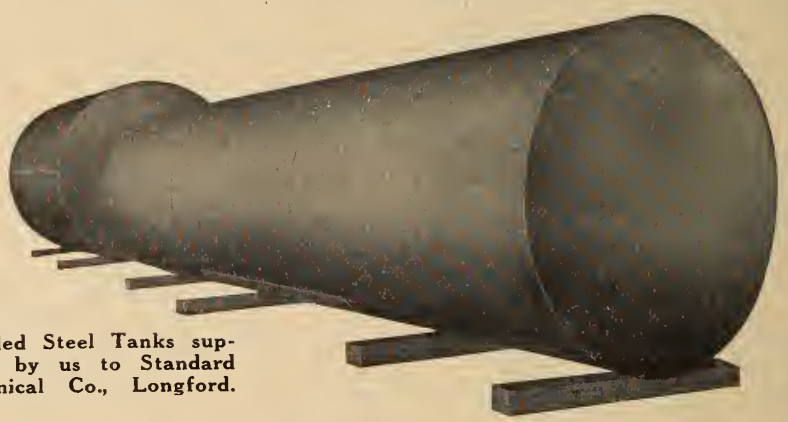

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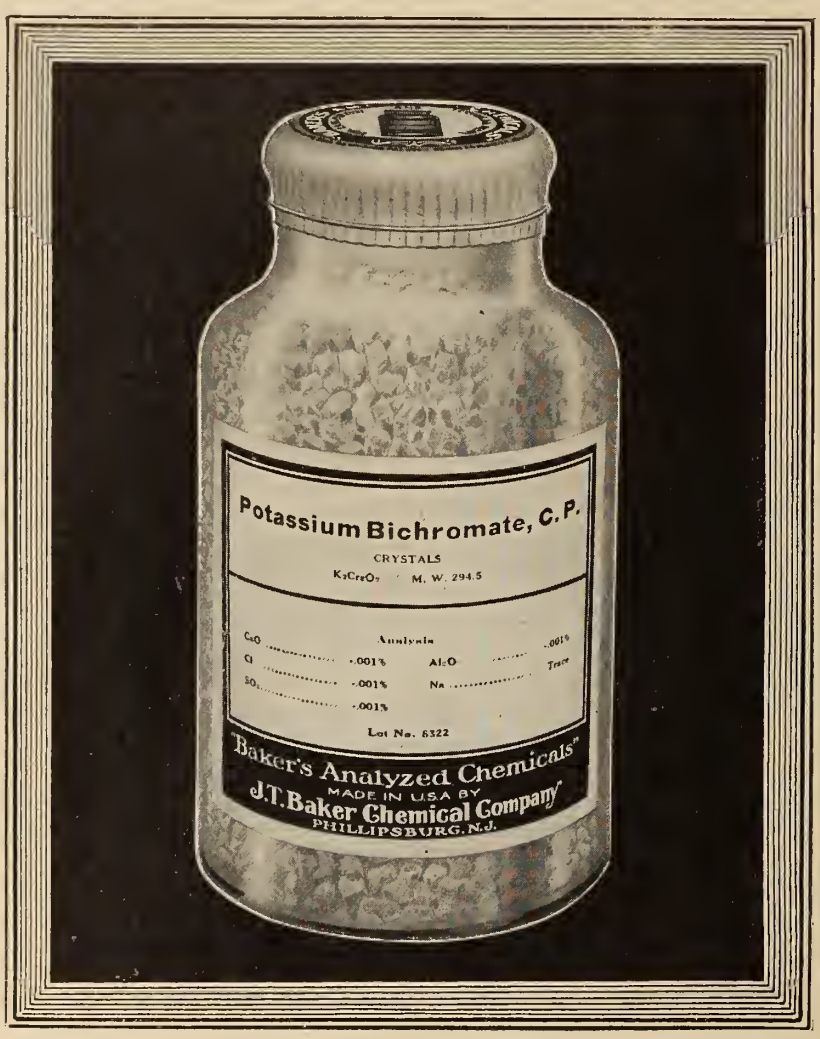

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Contents, Issue Number 38, Issued on December 1st.

Rapid Method for the Determination of Phosphorus in Brass and Bronze, by J. Casner and Wm. Kuebler. Determination of Alcohol in Mixture, by Simon Mendelsohn. An Improved Burette Jet, by Wilfrid B. Ault. Notes on the Determination of Sulphur in Iron and Steel, by Henry W. Kasper. Quantitative Determination of Carbon Dioxide, by J. T. Donnelly. The use of Alundum in Connection With Calorimetric Determinations, by Paul F. Hoots. An Improved Volumetric Method for Determining Sulphur in Iron and Steel, by Sylvester A. Weigand. Determination of Zinc in Fluorspars, by W. V. Brumbaugh. Good Practical Methods for the Determination of Molybdenum in Steel, by S. Little. Method for Determination of Uranium in Steel, by S. Little. The Determination of Nickel in Steel, by Robert J. Peters.

EDITORIALS

IMPORTANT PATENT LEGISLATION

BILL No. 20 pending before the House of Commons, Ottawa is of special interest to chemists. It relates to Patents of Invention and Section 16 deals particularly with inventions in Chemistry, Foods and Medicines. The bill is intended to replace the present Act.

The Act provides for the granting of patents for new and useful inventions in any art, process, machine, manufacture or composition of matter. The bill has the same provision but Section 16 limits the scope of protection to be obtained for new chemicals, foods or medicines. The limitation is that in these arts protection may be obtained for such substances, only where they are prepared by the particular process disclosed and claimed in the patent application. The inventor of an entirely new substance who may have spent much time and money in producing a substance which may be of inestimable value to the public, would thus have no right to the substance unless it is prepared by the special process disclosed. In these arts it is frequently if not always possible to work out new processes for producing a substance. The basic development is accomplished by the one who first produces the substances. Should chemist inventors not be granted the same protection as inventors in other arts?

It may be argued that a broad product patent covering a new substance restricts the development of new processes for producing the substance, and thus tends to keep the price high, because the owner of the product patent has full control of the substance. It appears reasonable to expect, however, that he would be ready to permit the manufacture of the substance by a new and improved method on satisfactory terms. On the other hand, if broad product patents are not granted there will not be the same incentive to produce new substances and chemical industries will suffer to the extent to which this is effective.

It is to be noted that a clause similar to this Section 16 was inserted in the British Patent Act in 1919 and that Germany, Switzerland and certain other European countries do not grant product patents for chemicals, foods or medicines.

Strange to say, the bill omits the definite provision of the present Act, for the examination of applications for patents and makes provision for referring all matters other than the regular grant of patents to the Exchequer Court (Sec. 21 and 40). There is no reason for these changes particularly in view of the large surplus revenue of the Patent Office, roughly a quarter of a million dollars last year. It would appear that the examination should be extended rather than curtailed, and that conflict cases and questions relating to the working of patents should be decided in the patent office.

Without examination many invalid patents will be granted and patentees and the public will be forced into the Courts. Many patentees cannot bear the high cost of litigation and they will be forced out of the field by the larger corporations. The Examiners are skilled in the various arts and are daily rendering decision on matters of invention. They should be able to deal more expeditiously than the exchequer Court with these matters which it is now proposed to refer to the court, and at no additional cost to the public.

The United States system of dealing with conflict cases by Examiners of interference is a good one, and it should be instituted in the Canadian Patent Office.

THE TORONTO CONVENTION

THE Annual Meetings of the Society of Chemical Industry and the Canadian Institute of Chemistry are slated for May 29th, 30th and 31st, at Toronto. Each year, we come to this time of annual deliberation, for a renewal of our enthusiasm and faith in chemistry, as applied to industry, and in chemistry as a profession.

For several years, there has been an industrial and professional tension, due to conditions and rapid professional growth. Now the dial should read "fair, with a little higher industrial pressure." This meeting probably marks a definite return to a pace in matters chemical, which we may hope to keep up and improve upon in a sound businesslike way.

It is a question if enough chemists really make the proper effort to attend annual conventions. There are so many who need just the influence they would secure, to brighten them up and perhaps waken them up to a more ambitious conception of their possibilities.

This coming meeting in our opinion will be a success, in so far as it attracts chemists who do not usually attend, or brings together those who have come from other countries to follow the profession here.

Our industries have a very large number of younger chemists, who, in their haste to specialize and learn something about their many new specific problems, have not yet learned the art of benefitting by intercourse with minds entirely devoted to some other type of work. They, too, are particularly

urged to remember that, after all, they are chemists, and that they owe it to their particular industry, and to themselves, to gather with other chemists to discuss matters of general importance. By so doing they may hope to share a portion of the very honorable burden that must be well distributed, if Chemistry in Canada is going to assist industry as it should, or remain a profession worthy of the opportunities presented to its members.

Our May issue will contain program plans, but right now the thing to do is to plan to be present.

CHEMICAL STUDENTS SHOWING THE WAY

THE graduating class this year, in the Department of Chemical Engineering, Faculty of Applied Science, University of Toronto, is larger than ever before. Some fifty-four men are finishing their course. The same relative condition exists at all our universities, but this class is taking a very novel way of selling their services to Canadian manufacturers.

In the April issue of "Industrial Canada," which is the official organ of the Canadian Manufacturers' Association, appears a page advertisement, which sets forth in no uncertain language the fact that Canadian manufacturers are presented with an opportunity of securing the services of these trained young men. The fact is brought right home to manufacturers that chemical engineering graduates represent the very best type of trained man-power that they can inject into their respective organizations. The class, under the guidance of the heads of the department, offers to demonstrate to specific manufacturers how they believe they can make themselves of value.

In addition, the editor of "Industrial Canada" is presenting a good article on the general merit and necessity of the idea of employing graduates in chemistry. In the past, we have lost many good chemists to the United States, because we did not seem able to compete for their services.

We are extremely hopeful that this effort will result in new openings being found in Canada for these boys and for many others graduating with them. Established chemists might help in this, by pointing out the advertisement and the article to a manufacturer, who could use a man with chemical training in any department of his business. It will be indeed a great loss if the relatively large classes at McGill, Queens and Toronto, and those graduating in Chemistry from our several provincial universities are not able to find suitable employment. Our industries certainly need them.

HOPE AND RESEARCH

IN Convocation Hall, University of Toronto, on March 17th, at a meeting of the Royal Canadian Institute, a lecture was delivered in even-toned simplicity, by a young man under thirty, a lecture that may well be recalled as one of the great lectures of medical history.

With no unnecessary words, and little oratory, Dr. F. G. Banting told a story tense with the drama of life—the story of Insulin and Diabetes.

There were no capital I's, but much appreciative mention of colleagues and those who, in any way, contributed to the present apparently successful issue of this valuable piece of research.

Seldom has a complex process of physiological chemistry been so simply and so adequately presented. The pancreas, the ducts, cells and the islets of Langerhans, the various methods of getting the islet secretion (Insulin), without impairment by the other strong digestive fluids, were tersely described. Soldiers in hospitals, cheerfully subjecting themselves to the new method of treatment and finding life in the results, the little boy of six on a diet of next-door to nothing, and no hope of anything much better, the girl of twelve down to forty-five pounds, even the dog whose pancreas was removed—these are sharply vivid in the recital, and when the little boy gets back to 1,200 calories a day and happiness, the girl rides horseback and swims, and the dog lives on indefinitely without a pancreas, with the help of Insulin, the audience breaks into applause.

We were mentally arranging an itinerary for Dr. Banting, that would take in the Senate, the House of Commons, and the Provincial Legislatures, and have research appropriations voted on, at the close of each lecture.

THE AMERICAN INSTITUTE OF CHEMISTRY

WHEN anything has grown, how easy it is to justify its existence! New ideas, on the other hand, are not held in such repute, by those who like to think of themselves as conservative, solid, and established.

The American Institute of Chemistry has arrived. It seems to have chosen New York as a suitable birthplace. The fundamental thing to consider in a matter of this kind is: Does it fill a place in the growing professional requirements of chemists? It undoubtedly did so in England and Canada, and, for a country such as the United States, where everything is organized from the top to the bottom, as well as sideways, we see no reason why chemists should not have an Institute of their own, if they wish it.

In fact, we welcome the establishment of an

American Institute of Chemistry, and believe that it will result in much good. An Institute is a very intangible thing. All professional organizations are built that way. They demand exceedingly careful direction, and the application of a high degree of judgment in their guidance.

These casual observations might be based upon specific cases, if a historical essay were in order. But the exercise, the doing of the thing, the self-analysis involved, is, on the whole, beneficial, and we welcome this occasion to give our blessing to what some day we can easily picture as the great American Institute of Chemistry.

MOVING THE FOREST PRODUCTS LABORATORIES

THE report that the Forest Products Laboratories are to be moved from Montreal to Ottawa came as a surprise to many, and the Government has received requests to delay action. The facts seem to be that the accommodation for these laboratories at McGill is insufficient, and a new building is urgently required. If the University were prepared, or in a position to supply ample space, a move might not be made, but the Department feels that, from the standpoint of administration, Ottawa should be the proper location. Administration, as we understand its application in some government departments, is not the whole object of these laboratories. They are to serve the public in general, and a very few industries in particular. Pep, leadership and money are as much required as non-technical administration.

If the move to Ottawa brings about a situation where the Government makes more valuable the work undertaken, all will be well; but if not, Montreal and McGill will have lost something and Ottawa will have gained nothing. Under present departmental organization, it is a question if several Ottawa laboratories are operating as efficiently as they might be, or are bringing their work home to Canadian industries in the most practical way. The Forest Products Laboratories of Canada should be humming with activity, they should be the real heart and centre of all progress and research for the industries served. We ask the question: "Are they, or have they ever been, and will the move to Ottawa help in this direction?"

SIR JAMES DEWAR DEAD, NOTED BRITISH CHEMIST

Sir James Dewar, prominent British chemist, passed away in his 81st year, at London, England, on March 27th. He was the co-inventor with Sir Frederick Abel of cordite, the smokeless powder. His contributions to chemical knowledge received recognition from scientific societies not only of Great Britain, but of the United States, France, Italy and Germany.

Droit de Cité aux Articles Français

NOUS publions pour la première fois un article en français qui nous vient d'un professeur de chimie d'une des principales universités du pays. Les facultés de chimie des institutions de langue française ont pris un essor considérable depuis quelques années, et il n'est que juste que nous leur accordions l'importance qui leur est due.

Toutes nos sociétés scientifiques et techniques possèdent des hommes de haute valeur dont la culture est rehaussée du fait qu'ils sont en mesure d'employer également bien l'une et l'autre des deux langues officielles du pays. Les ingénieurs et les chimistes de langue anglaise expriment souvent le regret de ne pouvoir parler le français; mais la création et le développement de ces facultés dans nos universités françaises permettront à un plus grand nombre d'étudiants anglais de maîtriser cette belle langue.

Nous espérons recevoir de temps à autre des chimistes canadiens des articles en français, et nous ferons toujours un plaisir de publier ces travaux en français. La majorité des chimistes canadiens peuvent au moins lire les deux langues; et nous espérons que notre revue servira ainsi à rapprocher des hommes de science à qui l'occasion eut peut-être autrement manqué de se connaitre et de s'apprécier. D'une façon générale, ce n'est que par le contact personnel et par la collaboration des divers éléments qui composent la nation que nous pouvons espérer d'édifier une nationalité homogène, et nous sommes heureux d'avoir l'occasion de présenter à nos lecteurs un travail dans une langue qui est, pour le moins, aussi canadienne que celle dont nous nous servons généralement.

WORLD CONDITIONS AND NEWS IN CHEMICAL FIELDS

(Special correspondence to Canadian Chemistry and Metallurgy by our London representative)

Chemical Plant Exhibit at British Industries Fair

The first section confronting the visitor at this year's British Industries Fair was the "Chemical Hall," arranged by the Association of British Chemical Manufacturers. Never before has Great Britain shown such a range of chemical products in a single exhibition hall, these including articles with a world-wide reputation.

A new feature of the Fair was a section devoted to chemical plant, organized under the auspices of the British Chemical Plant Manufacturers' Association. Of particular interest was a high-speed Plauson colloid mill, one of the most startling developments in chemical engineering of modern times. Solids when reduced to a very fine state of subdivision by this plant acquire new and valuable properties, and the applications of this process in industry are very numerous, these including paints, disinfectants, medicinal emulsions, lubricants, soaps, etc. A large range of acid-resisting enamelled cast iron plant was another prominent exhibit, vessels ranging from a few inches to seven feet in diameter being shown. During the past week or so, a further step forward has been made in regard to the standardization of chemical plant. Last year the Joint Research Committee of the Association of British Chemical Manufacturers and British Chemical Plant Manufacturers' Association issued a report on the standardization of steam jacketted pans, on which a British standard specification has been based. This has now been followed by the publication of a similar report on the standardization of cast iron filter presses, which has also received the approval of the British Engineering Standards Association. Such reports afford definite evidence of the organization and co-operation now being developed in British chemical industry.

Notable Developments in British Chemical Industry

According to public statements made recently by Dr. Herbert Levinstein, instead of only ten per cent. of the dyes consumed in Great Britain being of domestic manufacture, as was the

case prior to the war, British dye producers are now responsible for eighty per cent. of the consumption, and dyers are able to give a more satisfactory guarantee as to the fastness of British dyes than they were able to give before the war with German products.

During the two years following the armistice 25,000 tons of dyes made by the British Dyestuffs Corporation alone went into consumption in Great Britain, while the exports of dyed and printed cotton fabrics alone in those two years were worth £270,000,000. As the result of the remarkable progress made, the position of British textile manufacturers would not in any way be imperilled by the complete stoppage of dye supplies from Germany occasioned by the occupation of the Ruhr Valley by the French.

The building of a synthetic ammonia plant at Billingham by Messrs. Brunner, Mond & Co., Ltd., was described as being by far the biggest recent development in the heavy chemical industry, the step being in the nature "of a reply to the Badische Company's threatening gesture to the British alkali industry." Another development of very great importance was the linking up of the alkali industry with the organic chemical industries by the United Alkali Company, who had very considerably extended the manufacture of chlorine intermediate compounds for use in the dye and fine chemical industries. Other big developments since 1914 were the production of oleum, liquid chlorine, and synthetic hydrochloric acid, and the recovery of potash from blast-furnace flue gases.

In the organic branch itself, Dr. Levinstein instanced the manufacture of acetyl cellulose, acetylene and its derivatives, acetone and synthetic acetic acid, photographic chemicals and fine chemicals for research, essences, perfumery and medicine, the British Drug Houses, Limited, alone having a list of 3,000 products.

Price of British Dyes Greatly Reduced

The Dyestuffs Development Committee in Great Britain is very active at the present time and is collecting a large mass of information by systematic visits to the various works throughout the country. The average price of dyestuffs has been down from 4s. 6d. to 2s. 6d. per lb. during the past eighteen months.

Crisis in British Superphosphate Industry

The British superphosphate industry has reached what is described as a crisis in view of the competition with imported superphosphate placed on sale in Great Britain at prices actually below the cost of production at a British factory, and the Fertilizer Manufacturers' Association has addressed an urgent communication to the Minister of Agriculture calling its attention to the serious state of affairs resulting from the break in the French and Belgian franc exchange rate, to which this competition is due.

Dyes for Antiseptic Purposes

The investigations of Mr. F. H. Fairbrother and Dr. Arnold Renshaw on "the relation between the chemical constitution and antiseptic action in the coal-tar dyes," have created widespread interest which is not confined to the scientific world. Since they announced the first results of their investigations, about twelve months ago, they have continued their researches, and their general conclusions were made known in a lecture delivered before the Royal Society of Arts in London (address: 18 John Street, Adelphi, W.C. 2) on January 31st last. Experiments in sewage purification have given very satisfactory results, and the prevailing opinion in technical circles is that the facts established will have far-reaching scientific and industrial significance.

Export Trade More Encouraging

The Board of Trade returns for January and February were very encouraging, and as regards chemical products were the best for two years past. Exports of chemical products in January amounted to £2,247,000 and in February to £1,952,630 as compared with £1,625,000 in December. The products showing substantial increases were ammonium sulphate, caustic soda, sodium carbonate, copper sulphate, naphthalene, pitch and tar products.

Magnetic Searching for Metals in Sweden

For several years two Swedish mining engineers have tried a new method of electric searching for metallic veins. The invention—by Mr. Nathorst and Mr. Lundberg—during the past year was adopted by the State Department for Geological Exploration, and a real triumph was scored at the investigation of a maiden district in the north of Sweden, when a large field of copper ore and sulphur pyrites was discovered.

Swedish Iron Industry Improving

There were working in Sweden on December 31st last thirty-two blast furances out of a total of 130, as against twenty-two for December, 1921. The total iron and steel production last year amounted to: 259,700 metric tons of pig iron (about 35.5 per cent. of the 1913 production), against 314,400 tons in 1921; 342,900 tons of ingots and blooms (46.1 per cent. of 1913 production), compared with 236,000 tons in 1921, and 212,700 tons of rolled and wrought iron (corresponding to 61.5 per cent. of the 1913 figure), compared with 127,200 tons in 1921.

French Encourage Industrial Alcohol Industry

A Bill has just been passed by the French Chamber of Deputies, to come into force as soon as it has passed the Senate, requiring importers of gasoline, benzine, benzol and other mineral spirits, to mix ten per cent. of industrial alcohol with the imported fuel. This will provide an excellent motor spirit, and also a certain amount of revenue, for in France the State has a monopoly of the manufacture and sale of industrial alcohol.

French Iron and Steel Output

The output of pig iron in France during December amounted to 513,288 tons, as against 515,000 tons for the preceding month, and that of steel to 414,597 tons, compared with 404,000 tons. During the year 1922 France produced 5,128,608 tons of pig iron and 4,471,275 tons of steel. The figures for 1921 were 3,417,000 tons and 3,102,000 tons respectively.

Record Potash Production in Alsace

The official reports dealing with the production of potash in Alsace show that the output last year was no less than 1,350,000 metric tons of salts, equivalent to 230,000 metric tons of pure K_2O. This production marks a record in the French potash industry. In view of the severe competition now experienced and the general downward trend of prices the improved position is regarded as an indication that the potash industry in Alsace is being developed and maintained on sound economic lines. A greater range of qualities was also supplied last year.

By a special law passed at Paris on March 26th, 1921, the French State became the owner of the Alsatian mines, and the French Chamber has now finally decided that their exploitation shall be handed over to a single corporation embracing all the rival interests, including agricultural syndicates (50% control), chemical industries, sinistres residing in Alsace, the Departments, communes and chambers of commerce of Haut-Rhin, Bas-Rhin and Moselle, French shareholders in the old companies and personnel, with participation of the State in the management and profits. The concession is to be for 75 years.

The Mulhouse deposits are reckoned at the equivalent of 200,000,000 tons. Production under the provisional French management fell off greatly down to 1921, when it sank below 150,000 tons. French consumption has been up to recently about 50,000 tons annually, but to keep the mines profitably employed an output of 250,000 tons is essential.

The Condition of The Chemical Industry In Russia

A Review of The Condition of Some Russian Industries Previous to The Revolution, and Their Status at The Present Time

By B. Monsaroff, *Chemical Engineer and Licentiate of Economical Sciences*

Editorial Note: *Mr. Boris Monsaroff has presented our readers with a rapid survey of a situation, upon which little has been said by competent engineers. As a Chemical Engineer, who had a very responsible position as a manufacturer under the former order, and one who, until quite recently, was associated with the efforts of the present Government to bring about better industrial conditions, he has a personal knowledge of the path of events. Mr. Monsaroff is at present in Canada, where he hopes to again engage in his chosen profession of Chemical Engineering.*—The Editor.

ONE cannot say that before the war the Russian chemical industry stood on a high degree of development. In comparison to the territory of the Russian Empire and its natural resources and wealth, the development of chemical industry cannot be considered large. Yet it made, during the period of the last years previous to the war, some important steps toward more intensive growth, and the tendency was for further permanent development.

Agricultural chemistry was well developed. Russia was, and is now, an agricultural country; but the distribution of land among several classes of the population shows a balance more favorable to the large landowners. Among the latter, there were a number of gentlemen, so-called "dvorianstovo," who had a great influence on the absolute government of the Tsar. In order to support this system, and meet increasing deficits, considerable attention was given to methods of scientific agriculture and allied chemical factories were established. Industries using agricultural products were definitely encouraged. In order to cover these deficits, the landlords began to establish chemical factories, connected with agriculture. Among these were sugar-refineries and distilleries. The economic and financial policy of the Russian government was very favorable to an intensive development of these lines of chemical industry. The sugar industry was strictly regulated. The prices of sugar for internal consumption were controlled by the government and were on a very high level. The sugar destined for export was free of taxes, and, in some cases, the owners of factories obtained export premiums. That is the reason why Russian sugar has been sold on the foreign markets at much lower prices than at home. This policy made the sugar industry very profitable, and it increased enormously. In the year 1913, there were 240 factories, with a total production of 110,000,000 pouds of sugar, with a value amounting to 440,000,000 roubles (equal to $220,000,000). The financial policy of Russia and the system of taxation was very favorable also to the development of distilleries. This policy had been based on the wine or alcohol monopoly. Almost 50% of the state budget, which had reached, in the year 1912, to 3¼ million roubles ($1,625,000,000), had been covered with money obtained from the state's sale of alcohol. It is obvious that by such means these industries should flourish.

The Pre-War Textile Industry

The textile industry in central Russia (district of Moscow and Jaroslav) stood also at very high degree of development. The latter was a consequence of the natural wealth of Russia, as an agricultural country. The climatic conditions of central and north-west Russia are very favorable for industrial plants, such as flax. The raising of sheep of the highest grade was also very much extended in the south, and in the central provinces of Russia. The textile industry had, therefore, a sufficient supply of raw materials; and all conditions necessary for a flourishing development of this line of industry were present. But the textile industry of central Russia suffered greatly from the competition of the textile industry of the district of Lodz, a town of Poland, which, before the war, belonged to Russia. The Russian government always neglected the special needs of this line of industry; therefore, the leaders of the textile industry at Marasoff, who did not belong to the governing class, and others, were strongly opposed to absolutism.

The Leather Industry

Other lines of chemical industry showed a permanent tendency to advance. The production of leather, which previously lay in the hands of small factories, where most primitive methods were applied, was improved. Some big factories, highly equipped, conforming with the requirements of modern technique, had been established in several towns in Russia, for instance Shlenker at Reditchev. Bark-tanning, even in small factories, was replaced by drum-methods with contracts. At the same time, a large factory for the production of liquid tanning extracts was established at Kieff.

Pre-War Chemical Industries

The production of salts and acids stood also in a very high level of development. The concerns of Solvay in south, and Tentileff, at Petrograd, are well-known. The ceramic industry, and the production of glass was very considerable.

The rubber industry satisfied all needs of the Russian market in rubber materials and had a sufficient surplus for export. In the last few years before the war, the development of the fertilizer industry and the production of phosphate greatly increased the production of sulphuric acid. Comparatively on a lower degree of development were the dyestuff and pharmaceutical industries, which suffered by the competition of German goods. This competition was a consequence of the commercial treaty, which existed between Russia and Germany, previous to the world war.

The world war changed the general conditions of the chemical industry. The mobolization of large masses of the agricultural population lowered agricultural production and chemical industries, dependent upon agriculture. The production of sugar was diminished, owing to the lack of sugar-beets. The alcohol distilleries were closed, in consequence of the prohibition act, issued at the beginning of the war. These lines of industry had to accede their places to other lines of chemical industry, which were necessary for the defence of the country. The metallurgical industry increased enormously. Some big factories began to produce the highest types of steel, for instance high-speed steel, which, previous to the war, had not been produced in Russia. Also, the production of salts and acids made remarkable progress. In several parts, new chemical factories were established. At Petrograd, for instance, a large factory for the production of calcium carbide was built. In the south of Russia, new factories were established for the production of acids and salts of potassium and sodium. The dyestuff industry, which had been delivered of German competition, began work more successfully. The production of aniline dyestuffs was now possible in Russia. The production of industrial gases, (nitrogen, oxygen, and also poisonous gases for war purposes), went ahead rapidly. The organized forces of the state, for the purposes of defending the country, as, for instance, the War Industrial Committees, Union of Towns and Union of Semstvo, induced the other small factories, which had applied very simple and primitive methods of work, to improve their equipment and practice new methods. By such means progress was being made rapidly.

The Decay of Industry During the Revolution

Thus, at the beginning of the Revolution, Russia had a well-developed chemical industry. The following events changed the situation: The revolution, which had broken out in February, 1917, weakened the energy of those leading the war, and diminished the buying power of the state and the public. Many chemical factories were forced to diminish their production. Among the workers, inspired with the idea of the Bolshevist program, a movement for controlling the factories appeared. A hard struggle then took place between the workers and owners of the factories. The engineering societies, in order to save industry from destruction, did their best to bring peace to the struggling parties, but they could do nothing. The Russian engineer had no confidence in the workers in the factories. The engineer was considered as a representative of the capitalists, and therefore, as no friend of the working class. The appeal of the engineering societies to the owners of factories gave no results. In an extremely short time, the whole industrial equipment of the country was paralyzed and chaotic conditions established. The general political and economic condition in Russia brought about the Bolshevist revolution, and the usurping of power by the Bolshevist party.

Operating Chemical Industries Under the New Order

Then a new period in Russian chemical industry began. At the beginning of the revolution, in October, 1917, all intellectual classes of the population declared a hard boycott to the Bolsheviki rule. The state's officers refused to work under the Bolsheviki. The judges closed the courts. The engineer only remained at his task and stood guarding the industries. They could, and would have saved the country from destruction; but, in spite of that fact, they became victims of their devotion. Many an engineer was killed, others dismissed or simply pushed out from the factories. Those who remained were obliged to work under the control of workers' committees and had no influence on the direction of the factory. No change, even of a purely technical character, could he make, without an acknowledgment of the workers' committee. Engineers then began to run away from the factories. They remained without technical control. The Bolshevist government did not take much heed of these events. They declared that Red technicians, that is skilled workers, would lead the factories. They opened short-term courses, in schools, where the workers had to obtain the theoretical knowledge necessary to the direction of the factories. These courses are still in existence, and the Soviet government still dreams of replacing the old engineers with new Red technicians and chemists. The graduates of these Red schools afterwards became administrators and managers of the factories; but the results of their management are appalling. The factories were quite destroyed. After two years only, the Soviet government understood that it is not possible to lead large industries without highly-educated specialists. Engineers and all specialists were then not only cordially invited, but mobilized. But, as the general conditions in factories, in regard to the relations between workers and engineers, had not yet been changed, many engineers avoided direct work in the factories, and endeavored to find places in the administrative offices of the industry. Most of them worked as clerks. The wages that these engineers received were very small. They did not exceed the wages of a skilled worker, and, in many cases, were lower than those of the worker.

The Engineer Essential to any Government

Now the conditions are changed: A good specialist is paid much better wages than before. Nevertheless, the Russian engineer applied all his efforts in order to restore industry, but the general conditions were so terrible that he could do nothing. The engineer was not independent in his work; every step was controlled by the worker and the administrator of the nationalized industry. The destruction of transportation and the lack of materials reduced his work to an absurdity. In fact, almost all chemical factories were closed. Only those factories operated which had been considered by the High Council of the People's Economy as most important for the economy of the country. Actual operations under these conditions can be illustrated by the work of sugar-refineries. In one year, 1920, all sugar refineries in Russia produced four million pouds of sugar, (one poud=36.114 lbs.) in 1921, three and a half million pouds, instead of one hundred and eleven million pouds in 1917. The average duration of the production period in 1920 balanced between five and twenty days, the majority of the factories having a production period one to twelve days, instead of three to four months, as in the year 1914.

The chemical analyses showed, as the writer remembers, the following figures:—

Sugar obtained from 1 berkovets (12 pouds) of sugar beets 40 lbs.
Instead of, in the year 1914.....82 lbs.
Definite losses—2%, instead of 0.5% in 1914.
Indefinite losses, 4.5%, instead of 1.5%—2% in 1914.
Consumption of fuel per 12 pouds of beets—3 to 5 pouds of wood.

The cost of production of a poud of sugar, calculated in gold currency, reaches to 10 roubles, instead of the normal cost of 1.75 roubles, and this is under the conditions of very low wages paid in Russia, the average of which is equal to 20% of the wages paid previous to the war. The writer has personal knowledge of a very remarkable fact, which took place in the sugar industry, a fact which will seem an anecdote. The branch of sugar industry of the district of Kieff, which embraced 59 sugar-factories, had produced, in 1920, 1,225,000 pouds of sugar, but had paid for the expenses of production in sugar alone 1,550,000 pouds, not to mention Soviet money, and other products, as salt, clothes, etc., as per arrangements with workers.

Russia on a Slow Up-Grade

With the beginning of the new economic policy, the chemical industry of Russia has revived. Several chemical factories began to work. The new system of managing the factories, the system of trusts, which are specialized in regard to any lines of chemical industry, has ameliorated the general conditions of administration and work. The position of the engineer is much improved also, since Lenine, in his speech to all Russian Conference of Soviets, declared that the most vital problem of Russia was the restoration of the economic forces of the country. Russia certainly needs more engineers and fewer politicians. Free trade, and better conditions of work stimulated the productiveness of labor, but one cannot say that the chemical industry and also other industries are now successfully operating. The production of iron and steel reaches only 4% of the production before the war; the average production of other lines of chemical industry does not exceed 7-8%. The results of sugar production of the past year are not yet known, but it is expected to amount to about twelve to fifteen million pouds—12-14% of the production previous to the war. In comparison with the year 1921, the average chemical production has been augmented twice to three times. The recent general situation of chemical industry in Russia can be illustrated with the following citation, taken from an article by Professor Bodganoff, single professor communist in Russia, printed in the *Ekonomickerskay Ishien* (Economical Life), a paper of the council of work and defence. Noting the growth of Russian industry, as a consequence of the new economical policy, he says: "The growth of industry might be considered as normal, if it were a consequence of the general economical restoration of the country, and if the industry, satisfying the demands of the country, could exhaust from the country the necessary means as payment for the services which the industry granted. But this normal connection of the industry with the general base of the national economy does not exist. Our free market, which has diminished buying ability, in consequence of the bad harvest, is not able

to absorb the recent production of the industry, and, therefore, we are forced to diminish even the textile industry."

A strange and phenomenal situation! A country with a population of over 130 millions cannot absorb its small production, in spite of the great need of everything. But this phenomenon can be easily explained, with the financial condition of Russia at present, and the inability of any authority under any plan to reconstruct in a brief space the largest and quickest break-down of established custom and order ever witnessed in any country.

BADISCHE COMPANY'S AGREEMENT WITH FRENCH GOVERNMENT

Particulars are now published of the agreement between the French Government and the Badische Aniline & Soda Works regarding the manufacture of synthetic ammonia. Apart from any French rights arising out of the peace treaty, and without prejudice to the rights of the Badische company, the latter in this agreement offer the French Government their voluntary assistance, and agree to supply all information and details necessary to obtain the most favorable results. All patents and licenses held by the company relating to the manufacture of synthetic ammonia are ceded to the French Government, and personal support will be given if this is required. French engineers are to have access to the works of the Badische company, who, during the life of the agreement, will give them information about all improvements, and undertake not to compete with the products of the new French works either in France or in the French colonies and protectorates. For their assistance in establishing the new works the company is to receive 5,000,000 frs. from the French Government, half of which is payable as soon as the agreement is in force and the other half when the new plant is working at one-fifth of its capacity. The sum named is equal to almost 5 per cent of the total cost of the new works. The Badische company is also to receive a varying share of the profits, ranging from 2 per cent. when the sale price is 5 frs. or more per kilogramme of nitrogen to 4 per cent. when the price is 2 frs., payable as soon as the new works have an output of 30 tons per day. The French Government also agree to keep the processes secret, and to give the company information regarding improvements made, but reserves the right to transfer the agreement to a private company. The new works are to be erected at Toulouse by German engineers of the Badische company, and are designed for an output of 100 tons daily. The agreement is for fifteen years, dating from the day when a daily production of 30 tons is obtained. Whether, in view of recent events, the contract will be carried out seems questionable.

NEW COMPANY TAKES OVER GERMAN POTASH SALES IN CANADA

Mr. A. Vogel, the American agent of the German Potash Syndicate, announces that a newly organized company, the Potash Importing Corporation of America, will take over the market of German potash in Canada, Cuba, Porto Rico and the United States on May 1st. From other sources it is learned that Mr. Robert Dollar, the Pacific steamship owner, is connected with the new arrangement and will supply transportation facilities across the North Atlantic. As American imports of potash amount to about 300,000 short tons per annum the new shipping concern will have an important place in the Atlantic trade.

The sales of the Kalisyndicat in 1922 reached the record figure of 13,000,000 metric quintals of pure potash. This figure is higher than that for 1913, when the totals included the returns for the Alsace mines. Exports to the United States were particularly active, although Alsatian competition was at times very keen. Sales of German potash for export amounted to 2,400,000 metric quintals during the first nine months of last year.

RUHR VALLEY OCCUPATION SERIOUSLY AFFECTS GERMAN CHEMICAL TRADE

The French occupation of the Ruhr Valley is having a pronounced effect on the chemical trade of Germany and supplies are bound to be even more uncertain than they have been even during the past few months, whilst the tendency towards advances in prices will no doubt continue.

Since the conclusion of the armistice the German chemical industry has seriously lost ground, despite a substantial increase in the number of workers employed, and production has not even yet reached fifty per cent. of the pre-war output except in a few branches. Exports of chemicals in 1913 reached 2,530,000 tons; in 1920 they were only 510,000 tons; 690,000 tons in 1921; and 890,000 tons in 1922. Exports of chemicals are only 8.9% of the total exports. There were in 1921 15,116 chemical works in Germany, employing 373,000 workers, as compared with 15,014 works in 1914 employing 245,000 people.

The Swiss Dye Industry

There has been little change recently in the position of the Swiss export dye industry and manufacturers are complaining of the effects of German reparation dyes on their foreign markets. Nevertheless, during the first nine months of 1922, 2,873,700 kilogrammes of dyes, valued at 42,321,000 francs, were exported from Switzerland, Great Britain, France and the United States having taken each about one-quarter of these shipments.

NEW TYPE OF OVEN FOR LIGNITE EXPERIMENTS

Important developments in the carbonizing of lignite at the Bienfait, Saskatchewan, plant of the Lignite Utilization Board of Canada, may be expected following the installation of a new type of oven, drawings for which are now in preparation. Experiments conducted at Grand Forks, North Dakota, by the United States Bureau of Mines, in which the Lignite Utilization Board co-operated, attracted a good deal of attention, and were very promising of commercial application.

This work has now assumed definite form in an arrangement whereby the United States Bureau of Mines will design an oven to be built by the Lignite Utilization Board for the Bienfait plant.

The original retorts used at Bienfait were not successful commercially. The new oven or retort is known as the Hood-Odell, and will follow closely the lines of the simple internally heated retort operated successfully at Grand Forks last year. The new type of retort does not provide for gas, tar or ammonia recovery, and to this extent is a return to the old beehive oven principles. Equipment that would recover these by-products, would be much too costly both to build and operate, for the present at least. But the new type of oven does give every promise of furnishing a smokeless domestic fuel, and that is the main thing after all. Later on when lignite briquetting has been well established as a commercial success, the necessary by-product recovery equipment can be added.

MOTOR FUEL FROM MOLASSES IN CUBA

The manufacture of industrial alcohol from molasses is a matter which is at the present time engaging much attention in Cuba, which had in 1920 an output of molasses amounting to over 185,000,000 gallons. The production of alcohol in local distilleries, other than those attached to sugar mills, is about 6,500,000 gallons, of which a great part is exported. The spirit, known as "Espiritu Motor," is for sale, side by side with gasoline in the streets of Havana and the greater portion of the public vehicles in that city are utilizing alcohol fuel at the present time.

Australian Customs Proclamation No. 72, dated 20th December last, revokes the prohibition of the importation into the Commonwealth of carbide of calcium.

The Fundamentals of Colloids as Applied to Paints and Varnishes*

By E. W. Fasig

In presenting this paper, two main purposes are in mind, first to give, if possible, a simplified explanation of what is meant by colloids, and second, their relationship to paint and varnish phenomena.

Colloidal chemistry has been an instrument with which many have mystified the uninformed by bringing it forth as a means of defense whenever some peculiar, unusual chemical phenomenon has occurred. They usually accomplished their purpose, for few of the great mass of individuals who have a good general idea of chemistry, have ever studied the fundamentals of colloids and their reactions. Colloidal research is still in its infancy, but a fair knowledge of the elementary fundamentals will enable one to understand many peculiar reactions.

All matter can be considered as being made up of small particles called atoms. A combination of two or more atoms, either like or unlike, is called a molecule. Therefore, "atoms are the units of which molecules are aggregates." If that is true, one can easily conceive of a division of matter finally arriving at particles of molecular size. This is probably what occurs when compounds go into solution. The divisibility in that case might be considered to extend even beyond the molecular stage.

If during the division of matter, some condition or conditions are brought into the process, which prevent further division, and if these conditions can be controlled by the operator, particles made up of aggregates of molecules will be produced, the size of which can be changed at will. If the division proceeds to the point at which the kinetic energy of the individual particle is sufficient to counteract the force of gravity, we have a condition in which the matter is in a finely divided state, the particles, although made up of many molecules, still remain in suspension. Such a system is colloidal. Colloids, are therefore, aggregates of molecules in such a finely divided state that their own kinetic energy is sufficient to counteract the force of gravity, thereby enabling them to remain in suspension. "The existence of colloidal systems depends on the Brownian movement (kinetic energy) counteracting the force of gravity."

We cannot conceive of a dispersion of matter, without also taking into account the medium in which the dispersion occurs. This medium, like the dispersed matter, may be either a gas, liquid or solid. The system contains two phases, the one which is finely divided is known as the dispersed phase and the medium in which the suspension is made, the dispersion one. The whole theory of colloids depends upon two phase systems.

The following table from Alexanders' Colloidal Chemistry, illustrates the possibilities of colloidal systems:

TABLE I.

POSSIBILITIES OF COLLOIDAL SYSTEMS

Dispersed Phase	Dispersion Medium	Example
Gas	Gas	No example, since gases are miscible in all proportions.
Gas	Liquid	Fine foam, gas in beer.
Gas	Solid	Gaseous inclusions in mineral (meerschaum pumice), hydrogen in iron, oxygen in silver.
Liquid	Gas	Atmospheric fog, clouds, gases at critical state.
Liquid	Liquid	Emulsions of oil in water cream colloidal water in chloroform.
Liquid	Solid	Mercury in ointments water in paraffin wax, liquid inclusions in minerals.
Solid	Gas	Cosmic dust, smoke, condensing vapors, (ammonium chloride.
Solid	Liquid	Colloidal gold, colloidal sodium, chlorid colloidal ice in chloroform.
Solid	Solid	Solid solutions, colloidal gold in ruby glass, coloring matter in gems.

As the sub-division of a substance proceeds, the exposed surface is enormously increased. This furnishes ideal conditions for chemical reactions and greatly magnifies the surface energy effects, such as adsorptions and interfacial or surface tension. The most of the peculiarities of colloidal systems can be attributed to the increased surface forces. As a matter of fact, before chemical reactions can be produced, it is necessary to get the reacting compounds in a fine state of subdivision and bring the unlike particles in close proximity. Ordinarily, this is accomplished by solution, fusion or some other similar methods. In the case of dust explosions, the enormous surface of the dust parricles exposed to the oxygen of the air furnishes right conditions for spontaneous combustion.

Zsigmondy divides colloids into reversible and irreversible. The irreversible colloids coagulate and precipitate out of solution without forming gels; the reversible colloids in concentrated solutions, tend to form gels that may be again dispersed (gelatine, silica gel).

Coagulation and gelatinization are the result of flocculation of the particles but in the case of gelatinization, a very small amount of certain other substances deflocculate the aggregates and the system again assumes the form of solution.

In working with colloids, the great tendency is to use high concentrations. This should be avoided for colloidal systems are, as a rule, in very unstable equilibrium and they respond readily to exceedingly slight changes.

It has been fairly well established that colloidal particles possess electrical charges. If in a system there are various substances in colloidal dispersion and they all possess the same kind of charge, the particles repel each other, thereby stabilizing the solution; if however, there are present both negative and positive particles, they will agglomerate. Just as soon as the agglomerates become large enough that their kinetic energy is no longer sufficient to counterbalance the force of gravity, precipitation takes place. Precipitation is oftentimes prevented by the addition of other particles known as protective colloids. As little as 0.0001 per cent. gelatin will in some cases prevent precipitation by its opposition to group formation.

Emulsions are colloidal systems in which both phases are liquids. The simplest form is oil in water or water in oil. In producing stable emulsions it is necessary to resort to protective colloids or dispersion agents. A very small amount of soap is used in water and oil emulsions; the yolk of an egg is used in mayonnaise dressing.

The Phenomena of Adsorption

As stated above, the exposed surface of an extremely subdivided substance is very large when compared with the total mass of that substance. In many cases where these particles are exposed to other substances there is a condensing or adhering of the other materials on the exposed surface. This condition is known as adsorption. Water when sprinkled on glass which has been recently cleaned, forms droplets scattered here and there over the surface. This is because the surface of the glass is covered with a thin film of some adsorbed substance and the water does not come in contact with the glass. If the glass is thoroughly cleaned before the water is applied, it is then wetted by the water, and a very thin uniform film is distributed over the surface. In other words, if a liquid is adsorbed on the surface of a solid, it wets the solid, but if it is not adsorbed by the solid, no wetting occurs. Glass dipped in mercury is not wetted, therefore, there is no adsorption of the mercury on the surface of the glass. Charcoal, either in a finely divided condition or in a porous mass adsorbs enormous quantities of gases. Bancroft points out that water may be carried in a fine-meshed metal sieve, providing that we first oil the meshes. Air passes through the holes, but as long as the water does not come in actual contact with the metallic surface and wet the wires, the surface tension of the water prevents it passing through.

*Delivered before the Production Manager's Club of Toronto, January 26th, 1923, by E. W. Fasig, Assistant Superintendent, Lowe Bros., Dayton, Ohio.

Adsorption not only occurs with gases by solids or liquids by solids, but it also occurs with liquids by liquids and solids by solids. Zinc adsorbed on the surface of sheet iron forms the well-known galvanized iron. Bancroft records an experiment where 0.032 grams of Prussian blue was mixed with 10 grams of coarse dolomite in one case and fine dolomite in another. In the first experiment the color of the mixture was deep blue, indicating that the Prussian blue was distributed over the surface of the dolomite particles, but in the second experiment the color was almost white, indicating that the dolomite was distributed over the surface of the blue pigment.

Under conditions where one material has the opportunity of adsorbing one of two or more other substances, there is often a marked preference for some one of them. This is known as selective adsorption. Pulp ground white lead when mixed with linseed oil rapidly separates itself from the water and adsorbs the oil. The degree of adsorption naturally varies to a great extent in selective adsorption. Finely divided solids in suspension not only select the other substances they adsorb, but to some extent at least, they determine the degree of adsorption, depending upon the conditions.

Colloids: The Common Ground of Chemist and Physicist

As time goes on, there is less tendency to attempt a definite distinction between physics and chemistry. In order to become proficient in the one, it is necessary to have a good knowledge of the other. The field of colloidal conditions is the common ground for both and from this field many of the future developments in science will come. Dr. Martin H. Fischer of the University of Cincinnati, through his study of the colloidal reactions of soaps has made wonderful progress in the study of tissue reactions in the human body. Others have gone to the colloidal field in their researches on bread, rubber, ceramic products, textiles products, paper and many other lines. One of the most fertile fields of all for the study of colloidal reactions is the paint and varnish industry. We have been dealing with colloids in this industry for years, and the paint and varnish men through empirical methods have learned what to do to keep themselves out of trouble and the remarkable thing is, they have been doing the very things they should have done, viewing the situation from a colloidal viewpoint, and have, therefore, been working for years with colloids and colloidal reactions without being conscious of the fact.

H. C. Bingham and Henry Green have shown that paint is a plastic material and not a viscous liquid. Plastic materials have the properties of both liquids and solids inasmuch as both flow under proper conditions, but in the case of plastics a certain pressure is necessary to change their shape, while liquids have maximum fluidity and will not maintain their shape. The pressure necessary to produce flow in plastics has been termed "yield value."

Hermann Plauson, a Russian physical chemist, has developed a colloid mill which is claimed will make stable colloids from coal, varnish resins, wood and many other substances. A. W. Kenney in the November 29, 1922, issue of *Chemical and Metallurgical Engineering*, predicts that with the use of this mill, varnishes and laquers of an entirely new type will be developed. We have been told by good authority that opaque pigments can be so finely ground that they become transparent.

Henry Green, in a paper presented before the American Chemical Society meeting in Pittsburgh, Pa., September, 1922, featured the importance of flocculation of pigments on paint consistency.

Importance of Colloidal Reaction in Paint Making

I mention the above for the reason that big developments, in the paint and varnish industry will very likely be made in the near future. Through scientific research the real facts are disclosed. Varnish and paint technologists of the future will find their success in a thorough study of the colloidal reactions of these products.

A paint system is extremely complex. The liquid phase is made up of various prepared oils, gums and thinners, to which has been added metallic soaps (driers). The solid phase is a mixture of multitudes of finely divided particles of varying chemical composition. The liquids are themselves colloidal in most cases, in which liquids are dispersed in liquid. The soaps (driers), ideal types of colloids, in all probability, are dispersed in a finely divided condition rather than in true solution. The pigment particles while too large to be true colloids, have all the properties of colloids, adsorption, exposed surface, flocculation, electrical content and surface tension. Is it any wonder that we sometimes have very unstable conditions which are extremely sensitive to slight changes?

An ideal paint, from the paint maker's viewpoint, is one in which the pigments are in a highly dispersed condition. A product of this nature approaches a true liquid. The yield value, which is the force necessary to overcome the surface energy of flocculation particles, is then very small and the mobility is relatively high. We have at our disposal at least two instruments by which the agglomerates can be dispersed, first by grinding, and second, by the proper use of prepared liquids that are dispersion agents.

Paint grinding in reality is not true grinding, but merely an intensive mixing. During the process the agglomerates are broken down, but the individual particles remain unchanged. In the breaking up of the flocculated masses the liquid portion is brought in contact with the surface of the individual particles, which, through adsorption, are covered with a thin film of oil. Some pigments do not readily adsorb the oil and although surrounded by this liquid, still in the true sense they are not wetted by it. It is analogous to mixing powdered glass in mercury, the mercury may completely surround the glass, but no wetting occurs. These pigments again flocculate, thereby squeezing out the oil between the particles and the tendency is to settle to the bottom of the containers in a rather dry mass. The wetted particles may again flocculate, but the thin film of oil which is adsorbed on the surface of each, breaks down the surface tension between the pigment particles and the settling is soft and easily broken up. A pancake on a dry hot griddle will stick, but when separated from the metal by a thin film of grease, no trouble in removing the finished product is experienced.

There are good reasons for believing that some of the varnish resins when combined with oils are not in true solution, but in colloidal suspension dispersed throughout the liquid phase. It is a well known fact that varnishes of heavy consistency when blended together, often give a mixture very thin in body. It is also a fact that thin varnishes often result in heavy bodied mixtures. The reduction in viscosity is no doubt due to flocculation. We have noticed that the viscosity curve for such varnishes is similar to the curves obtained by Bingham and Green for paints tested in their plastometer. There seems to be a yield value. The data on this are too insufficient, however, to enable one to make any positive statements.

In bad cases of pigment settling it will often be noticed that the particles of the precipitated mass seem to be cemented together in a gum-like condition. This is undoubtedly due to the adsorption of the varnish resins and driers by the pigment particles. If this is true, the surface of the individual particles is covered with a thin layer of varnish gums. As they come in contact with each other, the interfacial tension causes coalescence of the adsorbed materials. When this has proceeded beyond a certain point, the result is settling.

With active pigments there is no doubt a slow chemical reaction between the solid particles and the adsorbed oils. Under these conditions, the soap formed is likely to be in true colloidal form surrounding the solid pigment articles or aggregates of particles. If this is the case, one would expect coales-

cense of the semisolid soap with the well known thickening effects. However, the jellying effects are probably also influenced a great deal by flocculation.

Plauson discovered that there is a limit to the concentration of the dispersed phase in colloidal systems. After the saturation point has been reached, the addition of more dispersed particles seems to form another phase in which the original dispersion medium then becomes the dispersed phase. Might it not also be possible that the ratio of pigment to liquid tends to reach a saturation point for well balanced paints? Certainly maximum dispersion, yield value and mobility are affected by varying the concentration of pigments.

A Fertile Field for Research

Paint and varnish problems offer a fertile field for scientific research. A great many of our practices are the result of empirical methods. We have made progress, but tradition and a lack of faith have acted as handicaps. Tradition has prevented our adoption of the technology and practices that have proven highly successful in other industries. Lack of faith has made members of our industry suspicious of one another. Secrecy is becoming more difficult each year, for scientific information soon permeates the entire industry. How foolish it is for any individual or corporation to practice isolation and expect maximum success. Co-operation and understanding are necessary for true achievement. We have an interesting story, let us tell it and in so doing, stress the fascinating sources of true scientific research.

The Work of Dominion Government Chemists—II.*

Chemistry in the Department of Agriculture

By Dr. F. T. Shutt

THE establishment of the Division of Chemistry was coincident with that of the Dominion Experimental Farm system, of which it is an integral part. The thirty-fifth annual report of its activities has just been issued. Its functions and duties were not clearly defined in the Act establishing the Farm System, but from the outset these have been interpreted as including two main lines of work: (1) Investigation or research towards the solution of those Canadian agricultural problems—general and specific—requiring the aid of chemistry and (2) chemical service, i.e. educational and advisory work for the man on the land, which has now developed to such a degree that the division has become a veritable bureau of information used by farmers from the Atlantic to the Pacific.

In addition to the foregoing principal phases, the Division has undertaken as required analytical and research work for the several branches of the department of Agriculture—Health of Animals, Live Stock, Entomological Seed, Dairy and Cold Storage, and for other departments of the government service, e.g. Interior, Marine and Fisheries, Post Office, Naval and Customs and Excise. In a very real sense, therefore, the Division acts as a Bureau of Chemistry for the government service.

Types of Investigations

Soils.—The complete chemical and physical analysis of representative samples of virgin (uncropped and untilled) soils from large and fairly uniform typical areas in the Dominion. This has resulted more especially in much valuable information in regard to the nature, exhaustion and economic upkeep of fertility of the soils of the prairie provinces.

Influence of cropping, methods of tillage, green manuring, etc. on the fertility of the soil.

Investigational work on soils for the Reclamation Service of the Department of Interior for the purpose of assisting in the classification of the irrigable lands of southern Alberta and southwestern Saskatchewan. The chief object of this work is the determination of "alkali" enabling a report to be made on the lands examined as to their suitability or otherwise for cultivation under irrigation. Incidentally, the problems of the vertical movement of alkali under irrigation and the relative tolerance of various crops to varying concentrations of alkali are being studied.

Investigational Work with Fertilizers

This is now being carried on on twelve farms or stations of the Experimental Farms System, and is designed to discover chiefly (1) the most economic composition and quantity of a fertilizer for use under the conditions peculiar to the province or district (2) the most profitable of the available sources of nitrogen, phosphoric acid and potash for general and specific fertilizer purposes (3) the comparative influence of various fertilizers employed alone and in conjunction with manure; and (4) the influence on crop growth of lime, lime compounds and other soil amendments.

Naturally-occurring Fertilizers.—Determination of the agricultural value of swamp muck, peats, tidal and fresh water deposits, marl, seaweed, etc.

Limestone.—Analysis of limestone deposits in the Dominion with a view of determining their value for the preparation of crushed or ground limestone for land treatment.

Manures.—Analysis of farm manures and investigations to ascertain the nature and amount of the losses in plant food and humus consequent upon their storage, protected and unprotected, in winter and summer.

Nitrogen Fixation by the Legumes: The determination of the value of the legumes—clover, alfalfa, vetch, etc.—for the maintenance and increase of soil fertility. This enquiry has shown that through the agency of the legumes much atmospheric nitrogen may be added to the soil's store of this element for future crop use and thus proven of great value to Canadian agriculture.

Investigations in Agricultural Meteorology: The work of determining the influence of environment—climatic and soil conditions—on the composition of wheat was begun in 1905 and is still being carried on. In this investigation wheat from the same stock is grown on the several branch farms and stations 22 in number—throughout the Dominion and the harvested grain analysed. The results have shown that seasonal conditions may have a marked influence on the gluten content and strength of wheat.

The fertilizing value of rain and snow, as measured by their nitrogen content, has been determined. The results have proved of considerable interest in connection with the problem of the maintenance of soil fertility.

Developing the Canadian Sugar Beet

The more important factory varieties of sugar beet have been grown on the various farms and stations of the system from coast to coast and the product analysed as to sugar content and co-efficient of purity. This work has also in recent years included the comparison of beets from imported and home grown seed with the result that satisfactory evidence has been obtained as to the high quality of the beets from Canadian grown seed. The results are of a value in estimating the possibilities of Canada as a sugar-producing country.

Forage Crops

The nutritive value, as measured by the dry matter and sugar content, of the more important varieties of mangels, turnips and carrots, as grown on the Experimental Farm at

*Paper presented at meeting of Ottawa Section, Society of Chemical Industry, January, 1923. Article I. in these series appeared in our March issue.

Ottawa, is determined from year to year. The influence of heredity, in the case of mangels, has also been studied.

The analysis of grasses, clovers, Indian corn, sunflowers, silo crops in general and other roughages has been undertaken to determine their relative nutritive value. Incidentally the influence of season, cultivation and time of cutting on their composition, have been studied.

Feeding Stuffs

The analysis of feeding stuffs including milling and industrial by-products possessing nutritive value is an important phase of the Division's work. This is undertaken in connection with feeding experiments carried on by the Division of Animal Husbandry on the central and branch farms and stations and also to furnish first hand information to farmers interested in stock feeding. Many feeding stuffs not coming within the jurisdiction of the Feeding Stuffs Act have been analysed and their nutritive value determined. Lastly, in this connection the division has by its recent investigations been instrumental in establishing new standards for bran, shorts and middlings.

Insecticides and Fungicides

As far as may be practicable, the new preparations of this character constantly appearing on the market are studied with the view of determining their nature, efficiency, etc. Original work has resulted in devising certain new sprays of some value in combating insect and fungus pests.

Well Waters

The analysis of well waters from farm homesteads is made free of charge and instructions as to the collection and shipment of samples are issued to farmers desirous of such an examination. In the course of years many thousands of samples have been analysed and undoubtedly the influence of this work has been towards the improvement of the farm water supply throughout the Dominion.

Administration of the "Meat and Canned Foods Act" and the "Oleomargarine Act"

All the materials used in and the products of the packing houses and canning establishments doing export or interprovincial trade in Canada, are subject to examination in the laboratories of the division. These comprise spices and condiments, salts and preservatives, denaturing oils, coloring matters, and inks, condensed and evaporated milks and milk powders, evaporated apples, butters and oleomargarines, lards, lard compounds and edible oils, sausages and preserved meats, meat and vegetable extracts, canned and preserved fruits and vegetables, etc. This work has furnished much interesting and valuable scientific information and has been instrumental towards obtaining and maintaining a high standard of purity for Canadian manufactured food products.

Bulletins

The results of the various phases of work of the Division are issued from time to time in bulletin form. These publications, also the annual report, are written largely for the non-technical reader and hence of wide interest and value to the farming community.

Staff and Equipment

The division started in 1887 with one man (who acted as chief cook and also as bottle washer) and a small room which served as laboratory, office and storeroom. To-day the staff numbers twenty, of which fifteen are trained chemists. The chemical building housing the division contains six laboratories; an extension is planned and promised which will add fifty per cent. to the present accommodation and afford much needed room for expansion.

Wood Samples from Tuts' Tomb

Dr. Kynoch, director of the Forest Products Laboratories of Canada, Montreal, is negotiating to secure chips of the various woods found in the tomb of Tutankhamen to the Laboratories, at Montreal, for identification. The Montreal collection of wood samples is now quite good.

Some Notes on Denatured Alcohol in Canada*

The purpose of the paper was to deal with denatured alcohol mainly from the chemist's viewpoint. A general survey of the different grades authorized in Canada was given and a comparison made with those in Great Britain and the United States. The comparative value of the denaturants used in the completely denatured grades for unrestricted sale, and in the specially denatured restricted grades was gone into quite fully. A synopsis of the paper is as follows:—

Of the total of over 4,000,000 proof gallons of ethyl alcohol produced in Canada according to the 1921 figures, only about a third was classed as "Industrial, non-potable alcohol." Of this third, roughly 60% was taxable and the remaining 40% was produced and sold as denatured alcohol. Figures on the production of the different grades as a percentage of the total denatured alcohol were also given.

There are 10 different grades of denatured alcohol authorized in Canada as compared to 3 in Great Britain and 81 in the United States. In Canada three out of the ten are for unrestricted sale and represent roughly 30% of the total denatured alcohol sold. One of the remaining seven restricted grades namely, No. 1 benzine has a sale of over 50% of the total denatured alcohol produced leaving only about 20% for the six other grades. The uses of the three unrestricted grades, No. 2 standard, No. 2 benzol and No. 2 pyridine, are mainly for burning and antifreeze, and paint and varnish. No. 1 benzine, containing 9% wood alcohol and 1% benzine as denaturants is used for the manufacture of varnish and shellac, drugs and chemicals, such as in aspirin, phenacetin and solid extract tritarates. The uses of the remaining six grades are for special preparations such as tincture of iodine, collodion, photographic prints, rubbing alcohol compound, etc.

In order to meet the government specifications and regulations a good denaturant must have the two-fold properties, viz.: (a) must make the ethyl alcohol product offensive to drink, in other words make it non-potable and (b) must make the recovery of the ethyl alcohol difficult. When complying to these requirements the resultant denatured alcohol is for special purposes made less suitable commercially, which is apparently the reason for the demand for the special grades.

Methyl hydrate (wood alcohol) is the principle denaturant. In meeting the non-potability requirements and in making the recovery of the ethyl alcohol difficult it is considered better than all the other denaturants used. Although finding extensive general commercial use, its uses for special purposes are limited by the impurities required in order to make it an effective denaturant. The lowest amount of methyl hydrate allowed as sole denaturant in Canada (No. 1 Special for Hospitals and Universities, representing only 2% of total consumption) is 10%. United States Formula No. 1 Specially Denatured Alcohol for sale and use under permit and bond, and also (Grade 1) Industrial Methylated Spirits, one of the restricted grades authorized in Great Britain, contain only 5% of wood alcohol as sole denaturant.

Other denaturants used in the Canadian grades are benzine (kerosene), pyridine, benzol, nitrobenzol, pine oil, iodine, potassium iodide, ether, cadmium iodide, ammonium iodide, brucine sulphate and diethylphthalate.

Commercially pure industrial alcohol (not denatured) is allowed in the chemical industries at excise duty rates ranging from 15 cents to $2.43 per proof gallon. Under the 15 cent rate are collodion, tooth paste, ethyl bromide, ethyl chloride, chloroform, sulphuric ether and soap. Vinegar comes under a 27 cent per proof gallon excise, perfumed spirits 75 cents,

*Summary of paper read by Mr. Ross E. Gilmore under the title of "Some Notes on Denatured Alcohol in Canada," before the Ottawa Section, Society of Chemical Industry, March 8th, 1923.

and proprietary medicines, pharmaceutical preparations, extracts and essences at rates of $2.40 to $2.43.

There is as yet no specially denatured grade in Canada for motor fuel. Two grades containing benzol and gasoline respectively are authorized in U.S.A. and one in Great Britain. It is recognized that for present day motor fuel purposes ethyl alcohol has few superior merits to petroleum products, but may be much superior in the future, depending on the development of high compression motor engines.

After giving a short history of denatured alcohols in Canada and reviewing the factors said to cause the sale price in Canada of denatured alcohol to be double that in United States and Great Britain, Mr. Gilmore concluded with a few remarks on the importance of the quality of the ethyl alcohol going to make up the different grades.

New Refrigeration Appliances, Apparatus and Processes*

By R. A. Tait

In this special field of work, the production and application of mechanical refrigeration, apparatus and process is undergoing important and progressive change, and while it is true that all change is not necessarily progress, as evidenced by object lessons of the past, important improvements have been recently made which set new standards of production and economy.

In a summary of new apparatus and process affecting our industry, we find we have little that is new which is not a progressive improvement, more or less radical, on such as we have been familiar with for years, and the object of this presentation is more to call attention to the availability of improved appliances, apparatus and processes than to enter into a detailed description of operation or to make an economic analysis resultant from their use which would, if it were possible to get together the data, carry far beyond the possible consideration which it is practical here to give to it.

The largest development in the last five years has been the rapid trend toward uniflow engine, electric motor and internal combustion engine driven compressors in connection with raw water ice making plants, multiple compression and compound compression.

Compressor types have changed to meet the demand for direct connection to the more economical power, and while the rotation speed has been increased, the piston speed has not been largely increased. With increased compressor speeds has come radical changes in valve area, lift and design.

Compressors are designed so that they are not only readily adaptable to any of the above sources of power, but so that should plant operating conditions change sufficiently to warrant the use of other power, it can be applied without costly changes to the machine. This development has brought about not only economy in operating cost, but in engine room space required, as compared with the older types of similar capacity. These changes have been largely stimulated by the advantage of their use in connection with raw water ice plants.

This in turn has brought about great improvements in the methods of making raw water ice. The treatment of water to be frozen and the air agitation have been greatly simplified, and in standard raw water plants one manufacturer has discontinued the forecooler as unnecessary.

As to water agitation while freezing, various systems are in use—high pressure, low pressure, air tube attached to inside of can and tube on outside of can, the drip pipe with bracket, the standard can and the stationary can.

The most recent development seems to point toward lower air pressure with the air probably being dehydrated sufficiently to prevent freezing in the tube and drop pipes during cool weather, and the use of perforated drop pipes which are allowed to freeze into the block of ice and are removed when the ice is harvested.

The ice crane hoisting a number of cans, while not new, is frequently used, and in some cases the cans are arranged in frames or baskets and the lifter is not attached direct to the can, but to the basket which with its cans are lifted, dumped, and returned to the tank as one piece. This arrangement is used in brine cooler fitted tanks, and require special tank top.

The stationary can filler at the dump is an improvement over the filler and hose type. Oxy acetylene welding is being used extensively in plant construction not only by the manufacturer in building apparatus, but in the erection of the pipe work. Ice tank coils are being welded in position so that there are no fittings to obstruct the brine in circulation, and heavy pipe connections are made where the use of fittings would be impossible.

An important development in refrigerating machinery is the increase in popularity of the enclosed compressor built from medium size down to less than one-ton capacity. These machines arranged for any type of drive are self-oiling, have but one stuffing box at the shaft, and will operate with the minimum of attention. The smaller capacity machines are mounted compressor with entire high pressure equipment on self-contained base which makes a very convenient unit for small installations.

The household capacity machine has come, whether to stay or not will develop.

Automatic apparatus designed to stop and start the compressor, regulate the water supply to condensers and liquid ammonia to the refrigerator are manufactured and guaranteed to operate with entire satisfaction.

In the application of refrigeration to large use aside from ice making, there is used in the chill rooms of the packing house a system of cooling by spraying brine in the space usually occupied by the pipe on the deck of the gravity air circulating bunker, the direction of the sprayed brine increasing the air circulation and refrigerating effect to the extent that where formerly hogs were cooled in condition to cut in forty-eight hours, they now do the work in twenty-four hours.

In cold storage work, brine spray is used in connection with suitably arranged ducts so that it performs the work of refrigeration, air circulation and purification all in one operation.

There is offered by the makers, a good line of all instruments to be used in the plant for determining conditions, the regulation of which, affect the economy of operation, and with which the well ordered plant should be provided.

Besides the advantages offered by Associations such as this, there never was a time when so much good advertising, descriptive and educational matter could be had for the asking as now, and in passing advertising, while it may not be called an appliance or strictly speaking an apparatus, it might be called a process, has become a real science in the methods used in presenting in the clearest understandable manner the newest product of the inventive brain, and the application of the idea as embodied in apparatus produced by the manufacturers.

In conclusion, and as before stated, in the modern up-to-date apparatus, appliances and process, there is little new in the sense that it has been recently evolved, invented or created, but rather it may be called the newest development in that particular thing. But let us not lightly regard these improvements. The present state of perfection has been arrived at through the expense of untold treasure and tireless effort on the part of those who have developed them, and made them more useful.

*Address given before National Association of Practical Refrigerating Engineers, 13th Annual Convention, St. Louis, Mo., Nov. 1-4, 1922.

Contribution A L'Etude Des Actions Catalytiques Des Rayons Ultra Violets*

Louis Bourgoin†

La connaissance des actions chimiques de la lumière remonte à l'antiquité grecque, mais les premiers documents qui valent la peine d'être signalés comme scientifiques datent de 1727. J. H. Schultze accuse la sensibilité des sels d'argent à la lumière; en 1801 Ritter et Wollaston découvrent que le spectre solaire au delà du violet est riche en rayons invisibles pour notre oeil, mais qui manifestent leur existence par une action très nette sur les sels d'argent, c'est de ce moment qu'il faut admettre la découverte des rayons ultra-violets dont la longueur d'onde s'étend de 4000 à 1000 unites "angstrom."

(A: unité; dix millième de micron ou dix-millionième de millimètre, le spectre total de la lumière va de 1000 à 10.000 A).

La photographie est la première application pratique de l'action chimique des rayons lumineux. Depuis quelque cinquante ans la littérature chimique abonde d'observations et d'experiences qui cherchent à préciser le mécanisme des actions physiques, chimiques et biologiques de la lumière en vu d'utiliser cette puissance énergétique très spéciale dont le type est le rayonnement solaire.

Il fallait cependant une découverte matérielle pour assurer aux expérimentateurs une source puissante et continue de rayons ultra-violets; les actions solaires sont lentes, l'atmosphère absorbe une bonne partie de l'énergie lumineuse ultra-violette, qui est d'un maniement peu commode au laboratoire. La découverte de la lampe à vapeur de mercure en quartz, qui est transparente aux rayons ultra-violets, est venue heureusement mettre entre les mains des chercheurs l'instrument maniable, dépensant peu d'énergie, qui leur manquait.

De cette époque datent les intéressantes recherches, sur lesquelles je ne puis m'étendre, de Daniel Berthelot et Gaudechon, de Victor Henri et de ses collaborateurs de Courmont et Nogier pour ne citer que les plus importantes.

Un des caractères essentiel des rayons ultra-violets est la réversibilité de leurs actions, ils ont une action décomposante ou photolyse qui offre bien des analogies avec l'électrolyse, mais ils sont aussi propres à effectuer des synthèses et on a comparé leur action aux ferments. Daniel Berthelot a précisé quelque peu leur rôle de catalyseurs ,tandis que Victor Henri étudiait la photocatalyse. La synthèse de l'acide formique a été réalisée en soumettant un mélange d'acétylène et d'oxygène à l'irradiation des rayons ultra-violets (C. H_2. 0_2). Le résultat ultime de la fonction chlorophylienne, combinaison de l'acide carbonique et de la vapeur d'eau pour former des substances ternaires ou hydrates de carbone a été obtenu pour la première fois par Daniel Berthelot, en dehors du vivant, au moyen de l'énergie des rayons ultra-violets. Inversement, le sucre a été décomposé par Victor Henri en aldèhyde formique et oxyde de carbone.

L'action décomposante des rayons ultra-violets est utilisée pour régénérer les atmosphères viciées par l'acide carbonique, ils libèrent l'oxygène; leur action bactéricide est employée pour la stérilisation des eaux de boisson, leur puissance catalytique est mise à contribution pour accélérer la maturation des gousses de vanille qui n'ont aucun parfum à l'état vert, on les utilise pour évaluer la qualité des matières colorantes; le coefficient de sécurité des poudres sans fumée; ils constituent un nouvel instrument à coté de la chaleur et de l'électricité et nous commençons seulement à nous en servir.

J'ai voulu, avec des moyens différents, apporter ma contribution à la connaissance des actions chimiques des rayons ultra-violets, c'est pourquoi j'ai entrepris les modestes recherches dont l'exposé sommaire va suivre.

Objet de l'Etude

En 1918 le Conseil des Recherches scientifiques et industrielles d'Ottawa m'accordait une subvention afin d'entreprendre quelques recherches sur les actions catalytiques des rayons ultra-violets.

J'avais pour objet: d'apporter une contribution à la théorie des actions catalytiques et de développer les emplois de l'énergie lumineuse fournie par les lampes à vapeur de mercure en quartz.

Le plan à suivre était:

1. Tenter de faire quelques synthèses chimiques obtenues ordinairement par voie catalytique en substituant au corps catalyseur l'énergie à haut potentiel des rayons ultra-violets.
2. Reprendre les réactions positives pour en étudier le mécanisme ainsi que le rendement et les possibilités industrielles.

Dispositif Experimental

Aidé de mon collégue le professeur P. Le Cointe et de notre assistant Mr. H. Beaupré nous avons opéré avec un élément lampe à vapeur de mercure en quartz mesurant 80 mil. de long dans sa partie active sur 15 mil. de diamètre moyen, fonctionnant sur un courant continu de 110 volts et demandant en marche normale 3 à 4 ampères sous une tension de 60 à 75 volts.

La lampe a été fixée sur un bâti spécial permettant, une fois allumée de donner au tube toutes les positions possibles depuis l'horizontale à la verticale. Le matériel d'exposition à la lampe était constitué de tubes en quartz transparents de différentes dimensions. On parvenait à réunir autour de la lampe deux ou trois tubes de quartz ou s'effectuaient les réactions. D'une façon générale les produits employés étaient rigoureusement purs, les gaz oxygène, hydrogène, acétylène, anhydride sulfureux étaient purifiés; ils devaient barbotter dans le corps liquide ou liquéfié, maintenu à une certaine température, la durée étant fixée, la quantité de gaz mesurée au compteur si nécessaire; on recueillait le produit obtenu soit par distillation soit par syphonage, soit simplement en arrêtant l'opération. Les produits ont été recueillis dans des tubes ou flacons d'une propreté rigoureuse avant de subir les épreuves d'identification ou de dosage par des méthodes certaines. Il a toujours été fait plusieurs expériences semblables.

Dans tous les cas, nous nous sommes bien gardés de conclure à une action positive, sans auparavant, effectuer l'expérience dans des conditions rigoureusement semblables, mais à blanc, c'est à dire en supprimant l'action de la lampe.

Resultats

(a) Oxydations: gaz sulfureux; l'Oxydation de SO_2 (anhydride sulfureux) par l'oxygène a été obtenue et bien caractérisée, la vitesse de passage des gaz devant la lampe importe beaucoup, l'action paraît rapide, si on la prolonge il s'ensuit une décomposition, la réaction donne lieu dans les tubes de quartz à de petites explosions très nettes; la qualité des gaz, humides et froids, favorise l'oxydation, en 5 minutes nous avons pu former jusqu'à 0.32% en poids de SO_3 soit 0.39% d'acide sulfurique.

Acètylène.—En faisant barbotter de l'acétylène dans de l'eau oxygénée au contact de la lampe, nous avons obtenu un produit très acide et des traces d'acétone ont été identifiées.

L'acétylène a pu être transformé en acétaldèhyde et en acide acétique au moyen des rayons ultra-violets.

$$C_2H_2+H_2O=CH_2.CHO$$
$$CH_2COH+O=CH_3CO_2H.$$

Le benzol oxydé sous la lampe a donné des traces de phénol ($C_6H_5.OH$) tandis que nous n'avons pu parvenir à oxyder le toluol (en acide benzoique).

*Communication faite le 11 decembre 1922 devant les membres des Sections canadiennes de la Societé de Chimie industrielle de France et de la Society of Chemical industry, à l Ecole Polytechnique de Montreal (Faculté des Sciences appliquées, Université de Montreal).

†Professeur de Chimie industrielle à l'Ecole Polytechnique, Université de Montreal; Directeur à la Montreal Dairy Co., Ltd.; Conseiller technique, Commission des Ligneurs de Québec.

L'oxydation de l'aniline et de son chlorhydrate nous a donné des résultats complexes que nous n'avons pas identifiés.

L'ammoniaque n'a pu être oxydée dans nos conditions expérimentales probablement à cause de l'action de la température.

L'aldéhyde acétique, les alcools éthylique et méthylique ont été parfaitement oxydés. Pour l'oxydation de l'alcool éthylique nous avons pu obtenir de 5 à 17% en poids d'aldéhyde, l'acidité exprimée en acide acétique a varié de 0.036% à 0.384%. Comme on peut s'y attendre la dilution de l'alcool favorise l'oxydation jusqu'au stade acide acétique, la température n'a pas dépassé celle de l'ébullition.

En oxydant l'alcool méthylique nous avons pu caractériser et doser l'aldéhyde formique (r. diméthylaniline) qui a varié de 0.18 à 2.64% en poids, cette oxydation parait plus difficile que celle de l'alcool éthylique.

(b) Hydrogénatione. Après de très nombreux essais, dans les conditions ou nous nous sommes placés, nous n'avons pu réussir à hydrogéner les huiles, même à l'état de vapeur. L'hydrogénation de l'azote, de l'acétylène, du nitrobenzène du benzène et de toluène nous a donné des résultats douteux.

Je passe sous silence un certain nombre de réactions qui ne sont que la répétition des synthèses déjà réussies par d'autres et qui ont été aisément reproduites.

J'en arrive maintenant à exprimer le regret de n'avoir pu continuer la série des recherches entreprises au moment où les resultats étaient des plus encourageants; le premier incendie de l'Université nous a obligé à déménager notre laboratoire de recherches pour donner asile à l'Ecole de pharmacie, un deuxième déménagement a dû s'effectuer aussi lors de la surélévation de la bâtisse principale de l'Ecole pour abriter les laboratoires de chimie industrielle. Mais l'Ecole est pauvre, et ce n'est que depuis quelques jours que, grâce à la bonne volonté de notre Directeur Mr. Fyen j'ai pu avoir à nouveau un laboratoire de recherches. Je ne puis promettre de continuer les travaux passionnants de 1919 et 1920; nous espérons toujours un mécène!

Mais je conclus cet exposé rapide de deux années de travail du soir. La lampe à vapeur de mercure en quartz nous dote d'une source puissante d'énergie à très haut potentiel, qui nous a paru agir non seulement pas sa quantité mais aussi par sa qualité, l'énergie vibratoire extrêmement rapide des rayons ultra-violets est capable de déclancher, au même titre que les corps catalyseurs, des réactions chimiques qui ne s'effectueraient qu'avec une grande lenteur. Si la chimie des hautes températures parait s'appliquer particulièrement bien aux composés inorganiques, la chimie des hautes fréquences semble pleine de promesses en chimie organique. A la chaleur qui a une action si néfaste sur les composés organiques issus du vivant, on peut espérer substituer l'action vibratoire de la lumière pour transformer ou construire les édifices si complexes des corps organiques. Nous savons à peine manier ces rayons ultra-violets, qui ont fait dire à Daniel Berthelot que si le 18ème siècle avait vu naître les machines à feu, le 19—les machines électriques, le 20—était en voie de construire les machines à lumière. Certes, il y a dans ce champ nouveau beaucoup de découvertes à faire, il suffit d'un hasard heureux pour que bien des inconnues disparaissent et donnent naissance à une découverte sensationnelle. Ce hasard a besoin d'être suscité, et si nous pouvions avoir donné à quelques jeunes le goût de la recherche, nous en serions vraiment heureux.

NEW METHOD FOR THE PRODUCTION OF SODIUM SULPHIDE

Mr. H. Freeman, of Vancouver, has recently reported to the Dominion Research Council that he has worked out a new method of producing sodium sulphide, which it is expected may be introduced as a commercial process. Mr. Freeman has been engaged for some time past on this and other problems and received a grant of $10,000 towards the expenses of his work. The Government will have an interest in any patents that may result.

Mining and Metallurgical Interests Hold Symposium on Fuel Situation

The chief subject before the 1923 meeting of members of the Canadian Institute of Mining and Metallurgy was fuel. This important matter was discussed by experts from the broadest national standpoint.

It is true that during the three days (March 7th to 9th) that meetings were held in Montreal, considerable was said about Institute affairs; but the papers and the discussions covered Canada's fuel problem. Much old ground was covered, and not very much developed that was really new. Perhaps the most promising result of such meetings is the stimulus to an increased interest in the matter, which is growing in government and railroad circles.

The presentation of latest mining statistics is a ceremony of some interest and value, and the Institute is to be congratulated on the co-operation secured with various Government departments. It is an effort of no mean order to be in a position to present in printed form even close approximations of 1922 records, so early in 1923. At present, the provinces are working with the Dominion Bureau of Statistics, and much duplication is being avoided.

Mr. S. J. Cook presented a report of the Dominion which covered the situation in more detail than is usual in a preliminary effort. Mr. A. O. Dufresne and Mr. Theo. C. Denis spoke for Quebec. In this province, asbestos is the principal item. The value of total production of minerals, including such items as brick and limestone, was estimated at $17,898,062 in 1922. The increase in this province over 1921 was 15%.

Quebec is looking to the time when in addition to her known natural resources, there may be developed, some precious metal production. If this time should arrive, this province may become a leader in volume and diversity of products.

Ontario was represented by T. W. Gibson, Deputy Minister of Mines, and W. R. Rogers, Statistician. In grand totals, the past year has been a good one, when compared with 1921. Gold production gained $6,000,000, and reached 1,000,180 ounces. The cobalt business also about doubled 1921 production, reaching 109,067 lbs. of metallic cobalt, and 398,697 lbs. of cobalt oxide. Mr. Rogers presented supplementary comparative world statistics, showing the high position of Ontario as a gold producer. The future heavy Canadian gold production will materially assist in financing other Canadian developments. Ontario is now $6,000,000 ahead of California.

In Nova Scotia, salt production is on the increase, and British Columbia metal production stimulated by better prices and operating conditions.

Dominion Statistics were given in our last issue, and there is a very bright future indeed for Canada, if the fuel situation ever gets straightened out properly.

The annual meeting seemed in favor of continuing its publication efforts, in a more restricted form. The past year has not been successful, from this standpoint. High costs have absorbed a high percentage of the reserve funds. Offers to relieve this situation by joining publishing forces with the *Canadian Mining Joufnal* were not deemed advisable, although the extreme difficulty any professional Institute has in financing a publishing business was quite evident. Alterations in By-laws, tending to re-classify members more strictly, according to professional qualifications, did not meet with favor, and it is unlikely that proposed changes will go through.

President W. R. Wilson, of the Crow's Nest Pass Coal Co. delivered his address in a simple, straightforward manner, so characteristic of the man himself. He took as his topic the history of the Institute and reminded the younger members of much that had gone before. For twenty years, the Institute has been developing, with an average acceleration of 22½%. During this time, its influence has been felt through papers re-

ceived and through the facilities created for co-operative expression. A strong plea was made for more company support. The Institute should not hesitate to point out that it is rendering such a service to various companies, through its benefits to members in their employ, that they owe a considerable debt to it. Mr. Wilson belongs to a very solid type, both mentally and physically. He has a world-wide viewpoint, having worked in England, South Africa, the United States and Canada. He counts no costs when it is a question of personal effort or study to better his own qualifications, and he recommends his medicine to those who would succeed, as he has, in their chosen profession.

Wednesday evening was devoted to pictures. Mr. W. S. Rugh, of the Consolidated Mining & Smelting Co., gave some excellent views of the lead and zinc recovery plants at Trail. Constructive work has been continuous for years at this plant, and the result is something that Canadian metallurgists may be proud of. In magnitude and scientific control, steady progress is being made. Zinc and lead, in commercial grades of the highest quality and purity, are being produced.

Under the direction of E. S. Winstow, of the Canadian Ingersoll-Rand Co., the story of compressed air was told. Nearly every application of compressed air machines was illustrated. As a labor-saving device in mining, the principle is ideal. It was pointed out that the high pressure used in Canadian drills made high repair bills.

The Symposium on Fuel

The only criticism that might be offered on the program was its verbosity. Important as well-known details are, some of the papers presented were not sufficiently boiled down. In the main, the Institute sent off a good resolution at the end of the Session; but it could have been framed just about as well at the beginning.

The fuel situation, as a subject for discussion, points out the futility of words as clearly as anything we know about.

The question of wood fuel was handled by R. D. Craig, of the Forestry Department. One is impressed by the statement that it would take the annual growth on a 30-acre wood lot to keep one house with the equivalent of 15 tons of coal per annum. Wood has the unfortunate habit of following coal in matters of price, and by the time it reaches the furnace of a city or town house, it manages to extract the last cent, as per the habits of all fuels.

Lignite next received its opportunity. In this regard, the "ifs" and "buts" were still uncracked, and "hope" seems to be the best that can be said for relief in this direction. We hope also that the future of governmental support of industrial research does not rest unduly on the immediate success or future of plans for the development of this particular resource.

Dr. W. H. Collins, in his address, stressed very properly the necessity for educational propaganda. All concerned—producers, buyers and railroads—would be more interested if there was an assured stability to the business. The matter was further reduced to an economic problem by F. H. Haanel and Dr. Charles Camsell, chairman of the Dominion Fuel Board. For Ontario and Quebec, Mr. Haanel suggested:—

1. Increase the limit of transportation of eastern and western fuels.
2. Use more peat.
3. Substitute coke for anthracite.
4. Develop electric-power more rapidly.

Dr. Camsell pointed out that the Fuel Board proposes three main investigations:—

1. The maximum economic annual production in Nova Scotia.
2. The possibilities of large-scale coke-oven practice.
3. To determine the eastern limit to which Alberta coal can be shipped.

MR. JOHN A. DRESSER
President, Canadian Institute of Mining and Metallurgy

The new president is a man both well-known and thoroughly well entrenched in the regard of members of the Institute. He is a native son of the Province of Quebec, and a graduate of McGill. For several years he was interested in educational matters. He joined the staff of the Geological Survey in 1909, but did not remain long with the government. He joined forces with the Algoma Central Railway, and gradually took up consulting work. During the past several years he has carried on several investigations, including rather extensive explorations for oil in the Peace River district.

He is known to be a man of sound judgment. and great reliability. With his office in Montreal, he will be able to give close attention to the development of the Institute, and there is no doubt but that he will more than fulfil his duty in the work that will come to him through the honor he has received.

Poor Leasing System in Alberta

Mr. W. J. Dick put his finger on an important point, in connection with Alberta coals, in his paper (delivered, in his absence by the Secretary), when he stated that mines already opened in that province could supply three times the demand. No business can stand the overhead and labor conditions which such a situation creates. It is hardly fair to ask the railroads or the state to allow this to go on, and make it profitable for everyone to secure leases. When freight rates are blamed, this should be remembered.

Mr. T. W. Gibson introduced a letter from Mr. M. J. Butler, which indicated that, if Alberta coal was handled in 5,000-ton trainloads, the freight to Port Arthur should be about $3.13 per ton. This would mean coal about $7.50 at Ontario points. Dr. C. V. Corless put the whole matter in a nutshell, with the statement: "Alberta's Fuel—Ontario's Market—Idle Railways."

Mr. C. Dean, of the Imperial Oil Co., and Mr. Schorman, of the British America Co., pointed out the growing tendency to use oil fuels. These had their place, and the price fluctuated with coal prices.

Mr. George H. Cushing, representing the Wholesale Coal Dealers' Association of the United States, pointed out quite

clearly that the Canadian market would not be given up without a struggle. He said an embargo would be very poor policy for the United States. His remarks made very clear our present dependence and the necessity for some solution. Mr. J. F. Brown, of the Hudson Coal Co., Scranton, Pa., felt that gradually but with certainty, anthracite would disappear from the Canadian market. The price would stay up, because of limited supplies.

British interests were represented by a paper from the South Wales Coal Owners' Association. This Association was considering the Canadian market from the standpoint of permanency.

Gold in Quebec

Some very excellent lantern slides were presented by J. W. Evans, relating to a trip through Northern Quebec. The gold area in Quebec is quite large, and has not had much work done on it. Two diamond drills were now working in Rouyn Township

Resin in Coal

R. T. Elworthy and R. K. Carnochan reported an investigation of a resin found at the Coalmont Collieries, Coalmont, B.C. The resin was floated from the coal in salt solution. Its industrial possibilities seem to be in securing it in quantity and marketing it in competition with darker varnish resins.

Moving Pictures of Ball Mills

Prof. H. F. Haultain, and F. C. Dyer presented the results of further work on this practical method of investigating ball-mills. The pictures show actual ball-mill conditions and are being used to build up a proper theory for design under various operating conditions.

The following resolution was passed and submitted to the Government on the fuel question:—

"Whereas the inadequate and unsatisfactory supply of fuel for central Canada cannot be viewed with other than national concern. The shortage this winter has been experienced before, and is bound to repeat itself as long as present conditions remain.

"Whereas the importance of wood, peat and electricity, while not to be ignored, is in effect, an auxiliary factor only, and cannot seriously be considered as a substitute for coal. Eastern and western Canada have the necessary coal deposits to satisfy fully, every requirement of central Canada. Our railways are demanding increased traffic; and moving Canadian coal to meet our own necessities will supply them with tonnage; and relieve Canada's dependence on a foreign supply.

"Whereas the proper solution of many of our national problems is dependent upon scientific and industrial research, and one of the most crucial problems facing Canada to-day, is this steadily increasing necessity of providing our own fuel requirements from our own resources; and

"Whereas this Institute has been informed that the Dominion Government has appointed a Fuel Board to study and report on this problem,

"Therefore be it Resolved, in this annual meeting assembled, of the Canadian Institute of Mining and Metallurgy, that we voice our complete accord with such action, and express the hope that the report of the Fuel Board will result in the appointment of a Commission of Engineers, empowered to investigate in a practical way the entire problem of transporting and marketing Canadian coal to such areas as are to-day dependent upon foreign supplies, in the belief that transportation is the most important factor in the problem."

UNIVERSITY OF ALBERTA REGISTRATIONS

A total of 1,283 students are registered at the University of Alberta, Edmonton, for the present term.

Chemical Society News

Containing Official Announcements of the Canadian Institute of Chemistry.

NEW MEMBERS, CANADIAN INSTITUTE OF CHEMISTRY

Fellows (F.C.I.C.)

Albert George Phillips, 257 Ottawa Ave., East Kildonan, Winnipeg, Man.

Associates (A.C.I.C.)

Homer L. Robson (formerly student member), Dept. of Chemistry, University of Saskatchewan, Saskatoon, Sask.

John Arthur Hanna (formerly student member), C/o Dryden Paper Co., Ltd., Dryden, Ont.

Student Members

L. O. Rolleston, Macdonald College, Que.
Lionel Lussier, 471 Belanger St., Montreal, Que.
Errol Boucher, 478 B. St. Denis St., Montreal, Que.
Doris Brophy, 1851 Church Ave., Montreal, Que.
Rosario Lavallee, 36 Gaspard St., Joliette, Que.
Paul Cartier, St. Hyacinthe, Que.

DENATURED ALCOHOL DISCUSSED BY OTTAWA SECTION, S.C.I.

A very interesting meeting of the Ottawa Section, Society of Chemical Industry, was held at the University Club on March 8th. Mr. F. J. Hambly occupied the chair and extended a hearty welcome to Dr. R. F. Ruttan, Past President of the Society. He referred to the value of the articles written by Mr. Gilmore and recently published in the *Ottawa Citizen* by the Editorial Committee, and drew attention to Bill 20 relating to Patents of Invention now before the House of Commons. He referred especially to section 16 dealing with chemical inventions, and section 21 relating to conflicting applications. He urged that chemists should study the bill and communicate their opinions to the proper authorities.

Dr. Ruttan stated that a careful examination of applications for patent is very essential, and referred to the omission of section 15 of the present Act and stated that this section should be inserted in the new bill. After considerable discussion the chairman appointed a committee consisting of Dr. Tingle, Dr. Macintyre and Col. Jansen to study the bill and report their findings to the proper authorities.

In introducing the subject of the evening the chairman referred to the importance of alcohol in the chemical laboratory and in the larger field of industry. He stated that many chemists did not themselves fully appreciate the extent to which alcohol was used in industry.

The first paper was that of Mr. Ross Gilmore, "Some Notes on Denatured Alcohol in Canada," an abstract of which appears in this issue on page 93.

Mr. M. M. Hale, followed Mr. Gilmore with a very able paper on the "Detection and Determination of Wood Alcohol in the presence of Grain Alcohol." The paper described a method worked out in the Customs Laboratory to determine how much methyl alcohol is present in a given sample. He referred to the several methods now generally used and showed a sketch of an apparatus used for separating the different fractions. He stated that the apparatus would readily separate fractions having only 10% difference in boiling point.

Following the papers there was an active discussion in which several members joined.

Dr. Ruttan expressed his pleasure at being present and congratulated the Section on their publicity efforts. In discussing Mr. Gilmore's paper he stated that the chemists' committee was largely responsible for the improvements in the present

denatured alcohol situation in Canada, but that further improvement was much needed. He pointed out that the high cost of denatured alcohol was a most important consideration and suggested that it would be preferable to have the denaturing process carried on in more places. Wider use of alcohol would reduce the cost. The customs and excise authorities should be induced to permit alcohol containing 5% methyl alcohol. If such were obtainable duty free many more products could be made.

Mr. Babington spoke of the use of platinum black for the detection of methyl alcohol, and thought that 2% methyl in methyl alcohol could be detected by this means.

After refreshments the meeting adjourned.

METALLURGY OF STEEL DISCUSSED BY MANITOBA CHEMISTS

The February meeting of the Manitoba Chemical Society was held at the University of Manitoba on the 27th and the members had the pleasure of hearing Mr. J. A. de Bondy, Chemist at the Manitoba Steel Foundries, give a most interesting paper on "Steel." Thirty members and guests being present.

Mr. de Bondy treated the subject under heads of: History; manufacture of steels, various processes of smelting, etc.; analysis of steels; metallurgy and miscroscopy of steel, annealing, structure, etc. The historical part of steel goes back as far as 3130 B.C.

Under the manufacture of steel, Mr. de Bondy explained very clearly the various smelting processes, such as the crucible process, Bessemer process, open hearth or Martin-Siemens, and finally the electric methods, explaining the various types and designs of furnaces, length of heating, linings, slags, etc.

His discussion of the analysis of steel was most interesting as it came from a speaker who has had several years of experience in such work and his familiarity with the different methods which are used for the determination of the different constituents used in alloy steels, such as nickel, manganese, chromium, vanadium, titanium, carbon, sulphur, phosphor, etc., was most interesting.

The most rapid methods which are used in control work in a steel foundry were described.

The metallurgical and microscopy of steel was probably the most interesting as it described the important part a microscope played in conjunction with the chemical analysis of steel.

Mr. de Bondy presented several photographs of the different structures of steel showing the effect of overheating, time o cooling, time of annealing, etc. He also had several specimens of the different alloys of steel, which had been differently treated in their manufacture.

After the paper considerable discussion took place and a hearty vote of thanks was tendered Mr. de Bondy for the enthusiasm which he took in his presentation of the paper. The meeting then adjourned for refreshments.

PERSONAL

Harold J. Roast, consulting metallurgist, has taken the position of vice-president and general manager of the National Bronze Co., Limited, Montreal. Through his numerous activities and work on behalf of the Canadian Institute of Chemistry, and Society of Chemical Industry, as well as his connection as a lecturer at McGill, Mr. Roast, has become one of the best known chemists in Canada. His many friends will wish him good success in his new business undertaking.

Mr. L. A. Davidson, F.C.I.C. has accepted a position with the Malt Products Company of Canada, Limited, Guelph, Ont., as research chemist. This company has made considerable progress within the past few years in the development of their various lines. Mr. O. G. Lye, F.C.I.C. is the technical superintendent.

TORONTO SOCIETY HEARS ABOUT LEATHER RESEARCH

Probably never before in the history of the Toronto Section, Society of Chemical Industry, have so many representatives of a particular industry attended a local meeting, as were present on Friday evening, March 23rd, at Hart House, to hear Professor George D. McLaughlin, of the University of Cincinnati, speak on "Research Work in the Tanning Industry."

It undoubtedly speaks well for the progressiveness of Canadian tanners, that so many were keen to take advantage of an opportunity of hearing the scientific side of their industry discussed.

As pointed out by the chairman, Mr. Westman, Prof. McLaughlin occupies a distinguished place in tanning research work. As head of the Department of Leather Research of the University of Cincinnati, he is carrying on a most valuable work, which has the full support of the Tanners' Council of America.

The meeting opened with a short address by Mr. T. A. Faust, of Yocum-Faust Co., London, Ont. Mr. Faust outlined the development of the Canadian tanning industry. There were to-day about sixty tanneries in Canada, of varying sizes, of which eight were quite large organizations with laboratories, and employing altogether about a dozen chemists. The principal leather produced was the heavy side shoe leather, which was all tanned within a 170-mile radius of Toronto. The Canadian industry was hardly large enough as yet to establish a leather research institute; but there was an opportunity, of which more might avail themselves, of co-operating with the work being done at Cincinnati by Prof. McLaughlin.

In his opening remarks, Professor McLaughlin told how the American leather industry had adopted an extensive research program, in order to meet European competition. This work was financed by the Tanners' Council; but the actual methods of carrying on the work were left largely in his own hands. Immediately following the inauguration of the work at Cincinnati, the English Government embarked on an extensive leather research program, while Germany had spent enormous sums along the same lines.

To-day the leather industry ranked as one of the first five important American industries. No industry had had a more interesting development. Tanning preceded agriculture. There were references to it in Egypt and China, 1200 years B.C. The first copy of the Koran was written on leather. Yet, in spite of all the research work that had been done, tanning was still largely an empirical practice. There were six principal steps in the whole operation of tanning: The death of the animal, curing soaking, liming, tanning and finishing. Upon the death of the animal, there were two changes set up in the hide, one a chemical change, and the other bacteriological. It was absolutely necessary in any research work on leather to combine the chemist's efforts with those of the bacteriologist; otherwise, any worth-while result would not be obtained. The changes that occurred at death were very important, because, depending on how quickly the hide was removed and treated, depended very largely the successful tanning of the hide. Upon death, an acid formation was set up in the skin, the principal acid formed being lactic, and the ability of the hide to swell was lowered. This swelling was a necessary factor in the process, and, were the hide removed immediately and put in lime solution, its ability to take up the lime would be 100%, but, if not removed for two hours, this was lowered to 90%. The bacteriological change consisted of the formation of bacteria of two main types. The injurious type tended to liquify the hide. Lantern views were here given, showing by charts the very harmful results following any delay in removing the hide.

The curing process consisted in covering the hide with rock salt, or better by immersion in a saturated salt solution. The curing prevented both the formation of acid and bacteria, if

carried on immediately after removing the hide. The soaking process consisted simply in soaking the hide in water, which returns the necessary amount of water removed by the salt, as well as cleansing the hide.

Liming was next done, in order to remove the hair, lime being used because of its cheapness. Sodium or potassium salts could also be used, but were more expensive. The tanning process consisted of combining a chemical with the hide to from leather. This was done by a series of baths or liquors, the weak liquors being used first, and increasing the concentration at each bath. This was not accomplished in a day or so, but took several weeks. Vegetable tannins, prepared from extracts of certain barks, were used, or metallic salts, such as chromium or aluminium. The final process was that of finishing. The leather was first oiled and dried, and then ironed and polished.

The speaker then took up the theory of tanning. There was yet but little known as to why chromium salt or vegetable extracts convert hide into leather; neither was there really any definite knowledge as to the manner in which minerals and proteins are combined in the natural hide. There was great scope for research work in these two phases alone. Then, there was the increasingly important problems arising out of the use of synthetic tannins, many of these being made from phenol and formaldehyde.

In conclusion, Professor McLaughlin expressed his great pleasure in addressing a Canadian audience, and was particularly pleased to have had the privilege of speaking to so many Canadian tanners. He extended the personal greeatings of President Moffat, of the Tanners' Council, and invited all Canadian leather men to take advantage of any results that might be obtained at Cincinnati.

Following the address, an interesting discussion took place. Mr. R. A. Lang, of Kitchener, inquired as to the status of synthetic tannins. Was there not danger of harming the hide by their use? In reply, Prof. McLaughlin stated that synthetic tannins had not been worked out as yet. They are being used now in a number of plants in the weaker liquor, so as to open the hide. They were also used in the finishing and bleaching of the leather. They did not increase the weight of the hide as well as they should. Mr. T. A. Faust spoke of the difficulties of determining the quality of these products by analysis.

To Mr. Neely, who inquired as to the lasting qualities of the synthetic tannins, Prof. McLaughlin said that, while these qualities were probably not always so good as they should be, yet the fact must be faced that, some day, the natural vegetable extracts will be exhausted and synthetic tannins will have to be used. There was a great deal yet to be learned about them, and much research work to be done.

Mr. John Acton, Toronto, for many years identified with the Canadian leather industry, as editor and publisher of the *Shoe and Leather Journal*, in response to a request by the Chairman for a few remarks, referred to the many important advances that had occurred in the Canadian tanning industry during the past twenty years. He remembered the first time chrome leather had been made in Canada, and gave other interesting accounts of changes and progress.

A vote of thanks to the Society, on behalf of the leather men present, for having given them the opportunity of hearing Professor McLaughlin, was moved by Mr. G. Beard more an seconded by Mr. E. Breithaupt.

The following leather companies were represented:—Davis Leather Co., Mr. E. J. Davis, Jr.; The Collis Leather Co., Mr. T. S. Roelstad and Mr. E. D. Bonisteel; King Bros. Co., Mr. Theodore King and Mr. R. King; Barrie Tanning Co., Mr. John Sinclair; Beardmore & Co., Mr. A. O. T. Beardmore, Mr. G. T. Beardmore, Mr. W. A. Moore, Mr. A. Hall and Mr. S. Burkes; Lang Tanning Co., Mr. R. A. Lang; Wickett & Craig, Mr. T. A. Craig and Mr. K. M. Kilbourn; Breithaupt Leather Co., Mr. C. Breithaupt and Mr. E. Breithaupt; Robson Leather Co., Oshawa; McQuay Tanning Co., Ltd., Owen Sound.

DR. WHITBY ADDRESSES MONTREAL SECTION, S.C.I. ON "CHEMISTRY OF RUBBER"

On Monday, March 19th, the Montreal Section held its regular monthly meeting at the Queens Hotel, Dr. A. R. M. MacLean presiding.

After the usual supper a communication was read from Dr. R. F. Ruttan drawing the attention of the Section to the pending patent legislation at present before Parliament. Dr. Ruttan made special mention of article 16 of the bill, whereby product patents for foodstuffs and chemicals were abolished, and urged the Section to study the question and to present its views to Ottawa before it was too late. A committee was appointed, consisting of Dr. A. R. M. MacLean, and Messrs. J. R. Donald, Chas. R. Hazen, Robert Job, W. H. Matheson, W. B. Wiegand and W. B. Woodland. Mr. Matheson stated that he had just received word from Ottawa to the effect that amendments had been introduced to remove the objectionable features of the bill; he added that in his estimation the examination of patents at Ottawa as now carried out was far from satisfactory, and that a more thorough search should be made, along the same lines as in Great Britain and the United States. Mr. Hazen suggested that the views of the Section should nevertheless be put before the authorities. The meeting passed a vote empowering the committee to draft resolutions and present them to Parliament through the Canadian Council of the Society.

Dr. G. S. Whitby then gave a talk on "The Chemistry of Rubber." After giving a brief outline of methods of gathering latex and preparing crude rubber from it, and of working this up into the finished articles with which we are all familiar, Dr. Whitby gave an insight into some of the very important researches which he is carrying on at McGill University, dwelling more particularly on vulcanization.

About 94.5% of the rubber consists of the hydrocarbon caoutchouc, the remainder consisting of about 2.5% protein and 3% resins, the word "protein" and "resins" being merely used to represent "nitrogen multiplied by 6.25" and "acetone extract," respectively, as little or nothing is known of their true nature. Dr. Whitby and his co-workers are now investigating the resins, from which they have already isolated seven or eight definite chemical compounds. The resins have a very high acid number, which varies within relatively wide limits, and which averages nearly 1.5% of acid calculated on the weight of the rubber. Dr. Whitby puts forth the theory that the action of vulcanization ultra-accelerators, which are strong bases, such as piperidine and its derivatives, is due to the neutralization of the free acid of the resins, with formation of the corresponding soaps. The latex is essentially an emulsion of caoutchouc, containing a certain amount of protein, which acts as amulsifier, and of resins, which tend to act as coagulants. The precipitation of the rubber by acid "kills" the protein; but the neutralization of the resin acids and formation of corresponding soaps by the ultra-accelerators tends to reconstitute the disperse phase and greatly facilitates vulcanization. Numerous tables and curves were thrown on the screen, showing the greatly increased rate of vulcanization (several hundred times) and also the increase in tensile strength (up to 40%) due to the use of ultra-accelerators. A hearty vote of thanks was extended to the speaker.

PERSONAL

Mr. A. Papineau-Couture, Dominion Analyst, has been transferred from the Ottawa laboratory of the Department of Health to the Montreal laboratory.

Mr. Robert Karlberg, chief chemist of the Holmen Bruks and Fabriks Aktiebolag Paper Mills, Norrkoping, Sweden, is on a visit to Canadian mills.

Mineral Production of Ontario, 1922*

Silver Ore Refineries

During the year 1922, the T. & N.O. Railway reported shipments of 1,015 tons to United States points and 5,796 tons to Southern Ontario refineries treating silver-cobalt ores, concentrates and residues. Plants are located at Welland, Thorold and Deloro. The first mentioned plant, operated by Ontario Smelters & Refiners, Limited, went into liquidation and passed into the hands of the Trusts and Guarantee Company of Toronto on May 30th. The Coniagas Reduction Company of Thorold received no new shipments during the year, but cleaned up materials in process. A new company, known as the Coniagas Alkali and Reduction Company, has been formed, to which shipments were made in 1922, but no recoveries were reported. The Deloro Smelting and Refining Company treated in all 3,720 tons of ore, concentrates and residues. In addition to the marketing of cobalt and nickel and their various compounds as noted in the table, a word may be said in regard to white arsenic of which 4,118,695 pounds worth $299,940 were marketed. In consequence of the ravages of the boll weevil in the cotton growing areas of the United States, there developed a strong market for the antidote, calcium arsenate, and prices of arsenic rose from about 7 cents per pound in April to 13½ cents in December.

The Deloro company started an insecticide plant in November, 1921, for the manufacture of calcium arsenate, lead arsenate and paris green. The company is considering the reopening of the old Deloro arsenopyrite mine, provided the arsenic market justifies the enterprise.

Lead and Zinc

The bulk of Ontario's lead production comes from the mine and smelter at Galetta, on the Ottawa river, operated by the Kingdon Mining, Smelting and Manufacturing Company. This company is installing a blast furnace to treat lead-zinc slags which have accumulated from treatment of concentrates in a Scotch hearth furnace. No zinc has been produced as yet by the company. The zinc reported in the table resulted from a shipment of 180 tons of zinc concentrates in 1919 to the United States by the Jas. Robertson Estate, former owners of the Galetta mine. This shipment had not been reported previously to the Department. United States refineries recovered 34,979 pounds of lead from Ontario silver and gold concentrates and residues. Lead has been valued at 6 cents per pound.

Non-Metallic Minerals

Feldspar—Production was about equal to that of 1921, with crude spar prices f.o.b. cars ranging from $6.00 to $8.14 per ton, depending on quality. During the year, 2,413 tons were ground at Toronto and Kingston, the value of the refined spar averaging about $18 per ton. The Frontenac Floor and Tile Company uses ground spar in the manufacture of floor tile and markets its surplus product. Exports were consigned chiefly to United States pottery and enamelware manufacturers, and also to makers of pebble dash for stucco work. Shipments were principally from Eastern Ontario, with one operator in Parry Sound district.

Fluorspar—As compared with 1921, the output shows a considerable increase. Prices varied from $13.50 to $15.00 per ton. The entire production came from Madoc in Hastings county.

Graphite—The Black Donald Graphite Company, operating a mine and mill at Whitefish lake, near Calabogie, Renfrew County, treated during the year 1,700 tons of crude ore. No ore was mined during the year. Of the total shipments, 95 tons were flake, and 531 tons were dusts, the total value being $34,124. Exports to the United States totalled 488 tons, and 138 tons were shipped to Canadian points.

Gypsum—Operations in 1922 were confined to those of the Ontario Gypsum Company, Limited, with head office at Paris. Quarries and mills are located at Caledonia and Lythmore, Haldimand county. During the year 106,824 tons were quarried, and 64,109 tons calcined. Products marketed were crushed gypsum 43,288 tons, ground 883 tons, calcined 11,661 tons, and calcined gypsum in various gypsum products 54,395 tons. The total, 110,227 tons of all grades marketed, shows an increase of 30 per cent. over the 1921 production.

Iron Pyrites.—The market for pyrites is stagnant, the output in 1922 being considerably short of the 1921 figures. This industry flourished during the war period when there was an abnormal demand for sulphuric acid. Natural sulphur from the Gulf States has displaced pyrite to a large extent. Low cost production on a large scale has enabled the United States, during the past three years, to take first place as a producer of sulphur, about one-half of which is used in acid making. Prior to 1903, when the Frasch method of melting sulphur in wells by the use of steam or boiling water was introduced, Sicily supplied about ninety-five per cent. of the world's sulphur. In 1922, Ontario producers were the Grasselli Chemical Company and the Nichols Chemical Company. The Sulphide property of the Nichols Company had a production, but the large deposits at Goudreau and Northpines were not worked. From the latter property, shipments were made in 1921 to the dock at Fort William, where 15,680 tons are stored for future shipment.

Mica.—Although the total tonnage of mica marketed greatly exceeded that of 1921 or 1920, the proportion of scrap was large. Rough-cobbed mica sold was eighty-six tons, worth $21,955, thumb-trimmed, twenty-four tons valued at $13,294, and scrap, 2,119 tons, worth $21,231. Owing to the occasional nature of sales to dealers, trimmers and splitters and to re-sales it is difficult to keep an accurate record of mica operations.

Natural Gas.—A preliminary estimate of production indicates a decline of about seven per cent. from the 1921 output. Conservation of the supply has been placed under the direction of a natural gas commissioner appointed by the Ontario Government and disputes as to rates paid by municipalities to operating companies are settled by a board of reference. Col. R. B. Harkness, the commissioner, reports as follows:—

> "The decline in production, which began in 1918, is becoming more gradual from year to year. This situation is attributed to a natural decline in rock pressure, a raise in rates, the stoppage of leaks in transmission lines and improvement in burning appliances, the last two having been the special effort of the Department in 1922. Drilling activities in 1922 were stimulated by a raise in rates, but results were somewhat disappointing, one company in Lambton and Kent counties having drilled ten deep wells from which only a small flow of gas was obtained, the majority being abandoned. More success attained drilling in Haldimand and Norfolk counties where a small field was discovered. Two fairly good wells were drilled at Point Abino in Welland county. Four "wildcat" wells in Halton and Peel have brought to light a shallow field of considerable extent, but with light pressure, sixty-five pounds.

Peat.—Experimental work by the Peat Committee appointed jointly by the Ontario and Federal Governments was continued during the season of 1922 at the Alfred bog, east of Ottawa. The fourth report recently issued by the Ontario Department of Mines, was accompanied by an appendix, being an interim statement, dated December 5, 1922, reviewing progress from 1918, the year of appointment. The final report by the peat committee is now in course of preparation. The season for

*In our March issue, page 71, a table appeared, showing the mineral production of Ontario for 1922, together with excerpts from the preliminary report of production, compiled by Mr. W. R. Rogers, Statistician of the Ontario Department of Mines. We are here giving further excerpts from the Preliminary Report.

peat manufacture is about one hundred days in southern Ontario. In 1921, 4,000 tons were made, but unfortunately a large part was lost through fire. In 1922 the output was 4,700 tons, of which 3,000 tons, worth $14,500 were sold. A great improvement in the quality of peat made last year resulted from the use of a "Swing Hammer Pulverizer." In view of the fuel shortage in central Canada when the import of United States anthracite is curtailed, it is the part of wisdom to thoroughly investigate every possible source of a substitute fuel supply. Peat fuel has many good qualities, being best adapted for fall and spring burning, and fireplace use.

To date, some forty-six Ontario peat bogs, convenient to transportation, have been surveyed by the Federal Department of Mines. These have a total area of 123,321 acres, and contain approximately 110,000,000 short tons of peat fuel, containing twenty-five per cent. moisture.

Petroleum.—Ontario's output of crude oil continues to decline. Production in 1922 was 164,732 barrels of thirty-five imperial gallons as compared with 172,859 barrels in 1921. In 1920 and 1919 the output was 181,750 and 221,100 barrels respectively. Average prices for the four years were $2.87 per barrel in 1919, $3.98½ in 1920, $2.70 in 1921, and $267 in 1922.

Quartz and Silica Brick.—There was a large increase in output compared to 1921, as a result of Electro-Metals, Limited of Welland operating its Killarney quartzite quarry. The bulk of shipments by this company go to Welland for the production of ferro-silicon. The Algoma Steel Corporation of Sault Ste. Marie manufactures its own silica brick and silica cement, the quartz coming from a quarry at Mile 19 on the Algoma Central Railway. The Mond Nickel Company operated its quarry in Neelon township, the output going to the smelter at Coniston for fluxing purposes.

Salt.—From incomplete returns, the inference may be drawn that salt sales in 1922 will exceed those of 1921. Production is centred in the southwestern peninsula of the Province. Included with the total output is the sale equivalent of brine used in chemical plants for the manufacture of bleaching powder, caustic soda and soda ash. Reports, up to the time of going to press, showed the following grades of salt sold or used: Table and dairy, 39,450 tons; fine, 28,702; coarse, 21,473; land, 5,728; pressed blocks, 2,489; brine for chemicals, 63,709; a total of 161,551 tons, valued at $1,537,512 without packages.

Talc.—Shipments show a considerable increase over 1921 figures, but are still much less than in 1920 when 20,359 tons were marketed. At the Henderson mine, from which the supply of the G. H. Gillespie Company, of Madoc, is derived, 10,161 tons of crude were mined. With the exception of a trial shipment of two and one-half tons of crude by H. H. Wood, of Mine Centre, the entire marketed product was treated or refined. From the Mine Centre deposit, district of Rainy River, crayons for metal workers were manufactured, the process being sawing, lathing and baking. Another deposit in the township of Zealand, district of Kenora, is being opened up by the Wabigoon Soapstone Co., Ltd. Moira Minerals and the Asbestos Pulp Company operated in the Madoc area and shipped refined talc.

Clay Products

Brick and Tile.—From the figures given in the table of production (See March issue, page 71) the following average prices per thousand brick are deduced. Common, $17.09; pressed, $20.05; tapestry or rug (rough texture face brick) $22.98. Hollow building tile, porous blocks, fireproofing and floor tile marketed was worth $526,566. Floor tile are produced at Kingston and Mimico. Drain tile output was fairly well maintained, but the demand is limited by the ability of the farmer to meet the expense of underdraining his land. The fact is noteworthy that the prices of farm produce have fallen to much lower levels than the commodities the farmer has to buy, with the result that purchases of drain tile and farm implements are curtailed.

Pottery and Porcelain.—The production noted in the table was entirely of unglazed flower pots. There is a growing production of glazed pottery and also of fire brick, chiefly from imported clays. Porcelain manufacture in Ontario is a growing industry, the chief product being electrical insulators.

Sewer Pipe.—Sales for the year exceeded those of 1920 and 1921. Only three plants operate in Ontario, namely, at Hamilton Mimico and Swansea. The special clay used is located at Aldershot near Hamilton. Sewer pipe was valued at $23.44 per ton, indicating sales of approximately 42,400 tons. Stock on hand at the end of the year was worth $227,493.

Construction Materials

Cement.—Plants were operated by the Canada Cement Company, Thurlow township, near Belleville, and at Port Colborne; also by the Hanover Cement and Stone Company and by the St. Mary's Cement Company. Production exceeded that of 1921, but the value dropped. Prices ranged from $1.50 to $2.22 per barrel of 350 pounds. Between 1916 and 1920, the average price rose by degrees from $1.05 to $2.15 per barrel f.o.b. works. Stock on hand at the end of the year was 396,911 barrels compared with 174,687 at the beginning.

Lime.—The small lime kiln for burning quick-lime for local use is rapidly disappearing and giving place to larger and up-to date plants, several of which are now equipped for the production of hydrated lime. Chemical plants and sugar refineries use about forty per cent. of the total output of quick-lime. Production for the year was 32,873 tons of hydrated lime worth $419,183 and 83,896 tons of quick lime valued at $896,296.

Sand-Lime Brick.—Production of this type of brick in 1922 shows a much greater ratio of increase than obtained for brick made from clay. Sales reached about one-half those for common brick, the average price per thousand being $17.09 for common and $15.76 for sand-lime, which explains to some extent the reason for the popularity of the latter. The great bulk of sand-lime brick is manufactured in Toronto and vicinity. They are used largely for foundations, as inside brick and as a base for stucco.

Sand and Gravel.—A marked increase in output is shown over that of 1921. Sand output is divided into glass, 1,838 tons, moulding 147,236, and building 756,318 tons. Gravel for all purposes (railway ballast excepted) exceeded 1,500,000 cubic yards, of which 528,193 yards was removed from the beds of great lakes and rivers by dredges and sand suckers under license from the Ontario Government.

Stone.—The Ontario Department of Highways reported the use in road construction of over one-third the entire output of crushed limestone. Limestone, produced for all purposes, was 1,693,387 tons, worth $2,032,133.

Classified according to use, limestone marketed was divided as follows: Building, 16,823 tons; chemical and fluxing, 83,751 tons; rubble and rip rap, 91,259 tons; crushed stone for concrete and roads, 1,501,554 tons.

Granite production (incomplete) was $17,789 and trap rock sales 156,654 tons valued at $155,103. There was no output of marble. Bancroft Marbles Limited, has reorganized, secured more capital and expects to operate extensively in 1923 with the help of electrical power now being developed.

New Tanning Extract from Western Australia

The Commonwealth Institute of Science and Industry has recently discovered a method of utilising as a tanning material "kino," the gum of the west Australian red-gum tree. The red-gum area is that State, covers twelve million acres, and "kino" can be collected at regular intervals from the same trees for an indefinite period.

Mining and Metallurgy in British Columbia

(Special correspondence to Canadian Chemistry and Metallurgy)

Duty on Scrap Copper, Zinc and Brass Needed to Establish Canadian Mills, Say Smelter Company

The Consolidated Mining & Smelting Company, backed by the Associated Boards of Trade for eastern British Columbia and the boards of trade in the coast cities are bringing to the notice of the Government, the necessity for the levying of a duty on scrap copper, zinc, and brass, and upon all base metals that can be supplied by Canadian producers in amounts sufficient to meet the Canadian demand.

The company, also, is urging that the Dominion Government should make an investigation into the price of coal. It claims that the high price of coal was the reason for the closing of the Rossland mines and the copper department of the smelter last spring. At that time coke was costing $14 per ton at Trail, and when it was found that the price of coke was not to be reduced the company was obliged to close its Rossland mines and its copper smelter and refinery, as it was impossible profitably to smelt the ores on a crude-ore basis with fuel at that figure.

In an address to the Associated Boards of Trade, Mr. J. J. Warren, president of the company, stated that the new concentrator at the Sullivan mine would be completed early in the summer, and then the Rossland mines would be re-opened and the ore concentrated at the concentrator at Trail, which now is being used to treat the Sullivan mine ore.

The Consolidated company has a copper smelter and refinery at Trail that is capable of turning out from thirty to forty million pounds of copper annually, and it has the building erected for a copper rod mill with a capacity for converting the whole of its copper output into rods and bars. As yet the machinery has not been erected in the building, but that would be done immediately if the company received any encouragement in the way of tariff from the Dominion Government.

Copper Mountain Concentrate to be Refined at Trail

Mr. H. S. Munroe, general manager for the Granby Consolidated Mining, Smelting & Power Company, has announced that the concentrate that is produced at the defunct Canada Copper Corporation's mine and plant, recently purchased by the Granby company, will be smelted at the Trail smelter, and that in future the blister copper produced at Anyox will be refined at the Tacoma smelter, instead of at Long Island, in the State of New York, as in the past.

Closer Co-operation Between Consolidated and Granby Indicated

These two announcements would seem to indicate a closer alliance between the two big smelting concerns of the Province, which should be for the general good of the industry. Copper Mountain, owned by Granby is capable of turning out from twenty to twenty-five million pounds in the form of concentrate yearly, and the Trail smelter needs this concentrate for the successful operation of its copper smelter and refinery. It is true that the Consolidated company owns the Old Sport mine, at Quatsino Sound, Vancouver Island, and a controlling interest in the Sunloch mine, also on Vancouver Island, and large reserves of copper ore have been established at both mines, that before the price of copper broke, in 1920, the company was contemplating the erection of concentrating plants at both of these mines, with a view to providing concentrate for the copper department of the Trail smelter, but, in the event of Copper Mountain supplying sufficient concentrate to enable the Trail plant to operate at capacity, the logical place for the treating of concentrate from the Vancouver Island mines is Anyox, rather than Trail, and as soon as the concentrators have been erected at the mines there is a strong probability that Anyox is the point to which the concentrates will be sent. The fact that in the future Anyox blister is to be refined at Tacoma, instead of in the State of New York, where previously it has been marketed, seems to indicate that Granby proposes to seek a new market for its output, for, obviously, there would be no economy in freight cost in sending the refined metal, instead of the blister to New York. The Consolidated company has built up an effective selling organization in the Orient, and it is likely that Granby will be given the advantages of this organization for its copper, on the understanding that Consolidated is to have the monopoly of the Canadian trade for that metal. Thus, the geographical disadvantages of the mines in relation to the respective smelters will to a great extent be overcome, and, as a result, both companies should be able to produce copper more cheaply.

The advantage of the closer alliance between the two companies does not end here. Granby owns its own coal mine, at Cassidy, Vancouver Island, and coke ovens, at Anyox, and the capacity of the ovens is more than double the requirements of the Anyox furnaces, consequently, it will not be surprising if the surplus coke is sent to Trail. Moreover, the Consolidated company has established a foundry and machine shop at Trail that is capable of turning out all the machinery required in a concentrator, with the exception of the primary crushing machinery and the electric motors, and, as soon as the Sullivan concentrator is completed, it is on the cards that most of the machinery for the 1,200 ton concentrator, which is to be erected at Anyox this year, may be manufactured at Trail.

Portland Canal Division

Intense interest is being shown in this district, which is not astonishing, for fresh surprises continually are cropping up. The Premier company recently discovered a new ore-body, four feet of which is said to average $132 in silver and gold per ton. The company continues to ship between 200 and 250 tons of ore per day, the largest proportion of which goes to the Anyox smelter, and is also treating from 100 to 150 tons in its mill, at the mine.

It is particularly pleasing to note that Canadian capital is meeting with success. Indian Mines, Limited, composed mainly of Montreal and Toronto shareholders, which owns a property to the north-west of the Premier property, has met with so much encouragement that it has increased its capital from $1,000,000 to $1,700,000. The increased money is required to continue the plan of development that has been laid out, and to provide funds for the erection of a concentrating plant. The mill will not be erected, however, until the development now under way has been finished, as then a better idea of the size of the plant that will be required will be known. The company has developed a considerable tonnage of milling ore, as well as a shoot of high-grade ore.

Mobile Mines, Limited, also composed of Toronto and Montreal capitalists, has been running a level on a vein running twelve to eighteen inches in thickness, and $300 to $350 in value, silver being the predominating mineral. The property is situated on Glacier Creek, which is a tributary of Bear River.

B. C. Silver Mines, Limited, owned mainly in London, is driving on the forty-foot lode, which is believed to be the extension of the main Premier lode. The company has erected an assay office and is installing machinery to facilitate the mining operations.

The Granby company has found a rich lode at the Sunshine mine, and is driving on it. As soon as weather conditions permit, the company will start to explore the George group, at the head of Bear River, and should development warrant the Portland Canal Short Line is to be rehabilitated and extended to the property.

Development at the Fish Creek mine, the Alaska-Daly, the Premier-Alaska, the Titan, and the Virgina, all of which are on the Alaskan side of the international boundary, are developing well. More than 100 tons of high-grade ore has been shipped

from the Fish Creek mine, and much more would have been shipped but for the difficulty of getting the ore to tide-water.

Kootenay District

All the recent improvements to the Silversmith mill, including the heating plant, were finished by the middle of February, and the mine is now making a net profit of close to $25,000 per month. A good separation is being made between the silver-lead and silver-zinc constituents of the ore, and the latter, which until the zinc schedule was introduced at Trail was a waste product, is now netting the company on an average $45 per ton. The zinc content averages fifty per cent. and the silver thirty-five ounces per ton.

The Standard Silver-Lead Mining Company has taken a lease and bond of a property at Four-Mile Creek, a few miles from the old Standard mine, which returned the company $2,700,000 in dividends. The Standard is in the hands of lessees, who are removing the pillars. The company has an option on a majority of the stock in the McAlister mine and an option on the Iva Fern mine, at Cultrus Creek. It was proposed to erect a mill at the McAllister, but the terms made with the Trail smelter for treating the ore have been found so satisfactory that it has been decided to ship the crude ore, for the present, at any rate.

The Inter-Provincial Mines Development Company, which is developing the Nip & Tuck mine, on Horse Thief Creek, Kootenay, shipped its first car of ore to Trail recently. The mine is said to be giving considerable promise. There is said to be 1,000 tons of ore, averaging $50 per ton in silver and lead, ready for shipping at the Paradise mine, on Lake Windermere.

Cariboo District

There will be a good amount of steady development in this old field during the coming season, Canadian, English, and United States capital all contributing. An English company has secured a large area of ground on the delta of Keithley Creek, and will prospect thoroughly, preparatory to dredging. A United States syndicate has secured ground near the mouth of Cedar Creek, and contemplates dredging. At the Kitchener mine, worked successfully last year, a large force of men is to be employed in hydraulic mining. Cedar Creek will again receive a good deal of attention. About $100,000 was cleaned up from this creek last season, and though the amount is small it was a big return for the labor expended. Last season's work, however, has demonstrated that the high benches, benches four to six hundred feet above the levels of the creeks, are worthy of consideration.

Boundary District

After two years of almost complete idleness, the Boundary district will take a new lease of life this year. The Granby company will have between four and five hundred men employed at Copper Mountain, recently taken over from Canada Copper Corporation as soon as the title to the property can be cleared.

The Hedley Gold Mining Company will employ between one and two hundred men at its nickel plate mine and mill. Some forty men have been employed at development work during the winter, and a good reserve of ore has been established for the summer's operations. Besides gold, the ore contains a large proportion of arsenopyrite, and with the marked rise in the price of arsenic during the last few months this should be a considerable source of revenue to the company.

An American syndicate is opening up a four-foot vein of silver-lead ore in Treasure Mountain, near Tulameen; one foot of which is clean galena, assaying more than 100 ounces in silver per ton, and sixty-five per cent. of lead, while the remainder is a good grade of milling ore. The old Eureka mine, which has been idle for many years, is being re-opened, and a level is being driven on a nineteen-foot vein of milling silver-lead ore. Unlike the ore in the Kootenays, the ore in this district for the most part is an easily concentrated ore; the matrix being quartz and calcite and the metal-bearing mineral galena.

Reported Discovery of Sapphires

H. W. Oakley, of Campbell River, Vancouver Island, claims to have discovered alluvium containing white sapphires between Courtenay and Cumberland. Mr. Oakley states that he has picked up forty-five stones within the last six months which jewellers pronounce to be white sapphires and which he has sold at the rate of $25 per carat. The stones range in size from one to three carats.

New Books Reviewed

"Modern Chemistry, Pure and Applied"

By A. J. Hale. Vol. VI. Virtue & Co., London. Westman Press, Toronto. Price $4.50

This is the final Volume of the very excellent series put out by this author. The complete set deals with manufacturing operations in all chemical fields, and a wealth of chemical data has been gathered. Because of the very high cost of reference works, such a series gives exceptional value for the money. The Volume deals with the chemistry and recovery of copper, silver, gold, and in fact the principal commercial metals, alloys and their compounds. It also contains an exhaustive Index for the complete set.

The value of this work consists in the care and judgment used in selecting commercial methods, and in the rather happy plan of presentation adopted when dealing with fundamental chemical theory and data.

"Glue and Gelatin"

By Jerome Alexander. Chemical Catalog Co., New York. 236 pages. Price $3.00

This well-known authority has contributed much to the value of this series by undertaking to cover this subject. Following a fundamental discussion of the chemistry involved, and theories developed, the technology of the subject is treated.

The subject cannot be touched upon without at once entering very deep water in the colloid field. Chemists will enjoy reading it, and those working in the field in any commercial way will find that the author has presented them with a valuable review of a long and broad study of a most interesting and difficult branch of science.

"Thermodynamics and the Free Energy of Chemical Substances"

By Gilbert N. Lewis and Merle Randall. McGraw-Hill Book Co., New York. 650 pages. Price $5.00

This book places thermodynamics before chemists in a way that should do much to increase the number who are prepared to work their way through to a point where profit may be had from the direct application of such principles to specific industrial problems. There is nothing quite so annoying as a smattering of theory and calculus, which leaves the owner quite helpless in the presence of practical and arithmetical problems. The portion of the work which deals with specific applications (and there are many), will recommend itself highly. On the other hand, it is no doubt the authors' hope that the fundamentals may take a new hold on each reader.

The book itself embodies the ideas of the authors, as expressed in numerous original contributions, along with much new data. All themes are developed with great care and pleasing clearness. The system of symbols used, will not be found difficult, even for those entirely unfamiliar with them, if the text is followed in order. As the authors state, the book is dedicated to the chemists of the newer generation, and it will, without doubt, have a wide circulation among both chemists in the making and those whose chemistry did not involve a sound training in this subject. With such authorship, much is expected, and no reader will be disappointed.

"El Arte de los Metales"

Barba. English Translation by Douglas & Mathewson. John Wiley & Sons, New York. Price $3.50

Alvaro Alonzo Barba was curate of the Parish of San Bernardo, Potosi, Bolivia, during the first third of the 17th century. His series of five short books is undoubtedly the earliest published work on American Metallurgy.

Reading it now, one is more impressed with what we owe to those who, since that time, have put the proper theoretical bottom in our knowledge, than the progress we have made in practical methods of treatment. The practice of recovering gold and silver from Bolivian ore is treated in great detail.

Book One, dealing with the general conceptions of Barba, as they related to natural substances, seems a strange mixture of keen experimental observation and philosophical nonsense, and yet, withal, probably quite as reasonable as our own writings may appear to those who come after us.

If a man finds fossils on mountain tops, he is not to be blamed seriously if he casts aside the theory that they are sea animals, for the more happy one that they are obvious indications that nature generates life, and that the earth is the creator. His theory may be quite wrong, and yet his knowledge of fossils of a very high order.

That part of the work dealing with testing, assaying, smelting, amalgamation, furnace design, and all the arts then practised, will be found most interesting to anyone who is a true student of metallurgical progress.

For metallurgists, we recommend this work as a tonic and a treasure for their libraries.

NAURU AND OCEAN ISLAND PHOSPHATE.

A report on the phosphate deposits of Nauru and Ocean Island; their workings and progress under Government control, has been issued by the Commonwealth of Australia. There has been considerable conjecture as to how these extensive and wonderfully rich deposits came into existence. What is known as the "bird" theory is the most popular and generally accepted. And it is in all probability correct, for phosphatized fish bones, sharks' teeth, etc., are continually being discovered. A phosphatized egg about the size of a hen's egg has been found; when broken the "yolk" fell out, a solid pebble of phosphate; the "white," or albumen, was represented by several layers, each as thin as tissue paper. But the original guano, in the form of bird excreta, must have been deposited many thousands of years ago. The result is that all impurities have long since been washed away, and only the pure phosphate of lime remains. To an unpractised eye the Nauru and Ocean Island phosphate is not different from ordinary friable, light-brown soil. Occasionally it takes the form of rock, some of which is as hard as granite, with a surface which will take a polish like any granite. The birds believed to be responsible for these deposits are now extinct, and the islands are now birdless, save for a few terns, noddies, and frigate birds. These phosphate deposits are very extensive; 4,000,000 tons have already been removed, and it can safely be said that there are on these islands not less than 100,000,000 tons of some of the highest grade phosphate known to exist. Throughout their working history (a period of about twenty years) the cargoes shipped from both islands have consistently averaged from 85 per cent. to 88 per cent. tribasic phosphate of lime. That portion of Ocean Island known as the plateau has yielded, for some time past, complete cargoes of phosphate averaging as high as over 88 per cent. This, it is believed, is without parallel in the history of phosphate mining. Though the Ocean Island phosphates are slightly higher in quality than the Nauru phosphates, the latter lends itself better to the manufacturing of super-phosphate, and is generally preferred by the fertilizer manufacturer on that account. These deposits are participated in jointly by the three Governments, Great Britain, Australia, and New Zealand; the price paid was £3,500,000, in the proportion of 42 per cent., 42 per cent., and 16 per cent., respectively. The business is now vested in a Board of Commissioners comprising three members, one from each Government, and each Government is entitled to an allotment corresponding to their share in its purchase, namely 42 per cent., 42 per cent., and 16 per cent., of the phosphate produced. One ton of phosphate makes nearly two tons of super-phosphate. This report gives working operations, price of phosphate, loading systems, and improved crop conditions and returns from use of super-phosphate.

MUNICIPAL ECONOMY: CITY'S REFUSE AS FUEL.

Sheffield (England) turns its ratepayers' refuse into fuel briquettes and sells same for £1 per ton. The usual system of dealing with the bulk of a town's refuse is by burning it in incinerators: Sheffield has two incinerators, which are of the "top feed" type, and consist of a series of cells or chambers arranged side by side. The refuse is tipped on or near the top of the cells, each cell having an independent charging grate. The cells are so constructed that the fumes given off are drawn over the fire in order to undergo combustion on their way to the main flue. On arrival at the main flue, the gases are led past the back of the cells and are then utilized for generating steam by means of one 27 ft. by 7 ft. boiler, and a water tube boiler, coupled. A horizontal steam engine of 100-h.p. furnishes power for general purposes, and the premises are lighted by a direct coupled 80 kw. generating set, and a 40 kw. set. The electric vehicles used for collecting house refuse are charged by these dynamos. With the object of determining, by practical experiment, the possibilities of treating refuse, a screening plant and washer was erected in 1918 for the treatment of house refuse, in order to obtain separately the various constituents in such form that they might be economically utilized. As shown by the screening process, the composition of house refuse consists of: Dust 33.3 per cent.; fine cinder 27.1 per cent.; large cinder 18.5 per cent; debris 14.37 per cent.; tins 1 per cent.; tags 0.4 per cent.; paper 3.6 per cent., and vegetable matter 3.73 per cent. The large cinder forms a valuable fuel, having a calorific value of 11,000 B.Th.U.: this is used for steam raising purposes at the Corporation baths in the city. The results of this experimental screening plant are so satisfactory that new works are being built, which will contain a large-scale screening plant capable of handling the whole of the dry refuse of the city. This new plant will have an output of 120 tons of briquettes per day, in addition to dealing with many tons of large cinders. A briquetting machine has been erected as a means of disposal of the fine cinder: the cinder is dumped into a hopper; whence it is conveyed by screw into conveyor buckets; the cinder then passes through crusher rolls and is again conveyed to a steam jacketed mixing pan, from which it is fed into a plug mill situated above the rolls. The cinder then drops between two sets of ovoid rolls, and the finished briquette is carried by conveyor into waiting vehicles. A binder of ground pitch (10 per cent.)

is added to the cinder. These briquettes are about the size of a bar of toilet soap; have a calorific value of over 10,000 B.T.U.; and are sold for £1 per ton. .

A NEW MOTOR FUEL.

A motor fuel which would be essentially cheaper than petrol has been the object of extensive experimental work in Great Britain for many years; and now at least one of these efforts seems an assured success. A British distilling company recently announced that the experiments which the company had been carrying out for two years on the production of a motor fuel had yielded highly satisfactory results. This fuel is produced by mixing crude whiskey with an extract from a vegetable of Indian origin; the mixture can be sold profitably at about one-half the existing price of petrol. A mixing plant has already been set at work in London, and is affording regular supplies of this new fuel to a limited number of customers. Further mixing plants are to be erected at Liverpool and Glasgow.

NON-FERROUS ALLOY.

A new metal alloy of the tungsten-chromium-cobalt class has recently been devoloped, and it is claimed that remarkable speeds and endurance cutting tests on cast-iron and alloy steels have been achieved. This metal is non-magnetic, contains no ferrous compounds, but has the appearance of steel. The metal is melted in electric furnaces and cast into moulds of steel in the form of tool bits, twist drills, reamers, inserts for built-up milling cutters, etc. It is impossible, says British Indian Crafts, to forge or anneal the metal, and the only way to alter the shape is by grinding. The metal is very dense and is stated to be free from blowholes and internal strains, with a high resistance factor that makes it particularly adaptable to cutting metals. It can be given excessive rake and clearance angles. Standard sizes of bits for commercial tool-holders are made, and also heavy duty slabs or blocks welded to carbon steel shanks.

AMMONIA BICARBONATE AS A FERTILIZER.

A German chemist has made a careful study of the industrial value of bicarbonate of ammonia, following up the interest taken of late in this chemical. He has obtained many interesting facts of its use as a fertilizer and compares its value with that of other well known cultivators such as sulphate of ammonia or nitrate of soda. One of the principal advantages claimed for it is due to its composition. It consists only of ammonia, carbonic acid and water, and so introduces no injurious or disturbing element into the soil. In sulphate of ammonia we get 100 kilogrammes of ammonia to about 300 kilogrammes of sulphuric acid and in using this substance as a fertilizer this large amount of sulphuric acid is practically wasted, which is a consideration at the present high cost of sulphuric acid in Germany at least. Moreover, there is a still more serious effect of the acid in the ground, as it unites with the lime and produces gypsum. The subject has also been freely discussed among English experts who are more conservative in their claims for ammonia bicarbonate and point out that its use is merely in the experimental stage as yet. They prefer to recommend "neutral" sulphate of ammonia which is acid free and bone dry. It is estimated that in 1923 about 75 per cent. of the British sulphate of ammonia will be of the neutral make.

ALCOHOL FROM ETHYLENE.

It has long been known that ethylene is absorbed by concentrated sulphuric acid with formation of ethyl hydrogen sulphate, which on hydrolysis, by dilution with water, yields ethyl alcohol and sulphuric acid, but little use was made of the discovery until recently, when Bury, experimenting at Skinningrove with coke oven gas containing less than 3 per cent. of ethylene, obtained a yield of alcohol amounting to 1.6 gallon per ton of fuel carbonized. De Loisy has since improved on Bury's methods by using catalytic agents which appreciably accelerate the absorption of the ethylene by the acid. The principal difficulty with gases such as those obtained in coking is the low concentration of the ethylene in them and the low absorption coefficient, which of course is less with a gas poor in ethylene than in one which is relatively rich.

Among other workers on this problem is Mr. J. D. Davis, a research chemist attached to the Pittsburgh Experiment Station of the United States Bureau of Mines, who has found that there are fuel materials which on distillation yield far larger proportions of ethylene than are found in coke oven gas. The best of these seems to be the fraction of crude petroleum that is known as fuel oil, but a mixture of that oil with coal dust is much cheaper and gives results only a little inferior. Experiments have been made with the pasty substance which is obtained in the Trent process of cleaning coal by means of fuel oil, and which consists of about two-thirds of extremely fine coal dust and one-third of fuel oil. In the trials the carbonizing temperature was maintained relatively low and as nearly uniform as possible, instead of being gradually increased to a high maximum as in coking, and at temperatures from 400 to 800 deg. C. the results were as follows:—

Temperature	Total gas	Ethylene.	Alcohol Equivalent. Gallons
Deg. C.	Cu. ft.	Cu. ft.	per ton.
400..	750	172	3.1
500..	4,400	750	13.8
600..	10,850	955	17.3
800..	19,800	1,760	32.0

These results show a striking advance on Bury's figure of 1.6 gallon of alcohol per ton of fuel from coke oven gas. At the intermediate temperatures the gas obtained from the Trent process product is nearly as good in quantity and quality as that from fuel oil itself, while at 800 deg. the volume of gas is practically the same as with fuel oil, but is of a higher thermal value—757 B.Th.U., against 710. In the last case the removal of the ethylene reduces the calorific value to 671 B.Th.U., and the loss in the heating value of the gas as well as the reduction in volume must be added to the cost of producing alcohol in this way. The value of the products would vary according to locality, the market prices of other fuels, and other circumstances; but if, for example, 10d. a therm could be obtained for about 18,000 cu. ft. of 671 B.Th.U. gas and 1s. 6d. a gallon for about 30 gallons of alcohol, the products from a ton of the Trent mixture of coal dust and fuel oil would have a value of £7 5s. 7d., without taking into account the residue of solid carbonized fuel, of which there would be about half a ton.

Industry and Trade

Industrial Developments---Trade and Company News---Financial Notes---Patents ---Market Review and Prices

INDUSTRIAL DEVELOPMENTS

VANCOUVER, B.C.—If a satisfactory freight rate can be secured for Western Canadian trade, Foley, Welsh and Stewart, owners of 115,000 acres of spruce and jackpine, along the British Columbia boundary in the Grande Prairies and High Prairie districts will erect a large pulp mill in that district at an estimated cost of $3,000,000.

WELLAND, ONT.—Canadian Steel Foundries will shortly re-open their plant, giving employment to about 200 men.

WINNIPEG, MAN.—It is announced that J. D. McCarthur & Co., Ltd., will this spring commence the erection of a pulp and paper mill at Fort Alexander, about seventy miles from Winnipeg. The plant which will have a capacity of 120 tons per day, is expected to be completed within two years. The scheme also provides for the construction of a railroad twenty miles long from Beaconia to Fort Alexander. The total estimated expenditure is $3,000,000.

SYDNEY, N.S.—Incorporation of the North Atlantic and Chemical Co., Ltd., is announced. The chief product will be a high-grade fish and meat packing salt, and plants will be erected at Bucklaw, N.S. and Gatereau, N.B. P. G. Petrie, H. W. Ingraham, A. S. Prouse, and George Ross are organizers.

TORONTO, ONT.—The complete line of power equipment of the International Combustion Engineering Corporation, New York; the Underfeed Stoker Co., London; The Lopulco Systems, Inc.; The Quinn Oil Burning Systems, and the Societe Anonyme des Foyers Automatiques, will be manufactured and sold here by the Combustion Engineering Corp., Ltd., recently incorporated under Dominion Charter. John F. Farmer, M.E.I.C., Montreal, will be the chief engineer.

The Electroplax Company, Limited, manufacturers of electrical insulation and moulded products, whose plant at Mount Dennis, was destroyed by fire, are installing equipment in their new premises at 163 Dufferin Street. They expect to be in full operation about May 15th.

LETHBRIDGE, ALTA.—Crystal Dairy, Limited, have just completed a new $60,000 plant and installed the latest machinery for butter and ice cream manufacture. Machinery and equipment cost $40,000.

NORTHERN ONTARIO NOTES

The Ontario Government has granted the request of Hollinger for a site on the Abatibi River for the purpose of developing power, according to President N. A. Timmins, of the Hollinger Consolidated Gold Mines, Ltd. While no definite site was named, it will be either at Island Portage or Long Sault, and in either case the opportunities presented will be sufficient to meet the Hollinger needs. At the former, 30,000 horsepower or better could be developed, while the latter offers opportunity for development of 25,000 horsepower.

RECORD TONNAGE PLANNED FOR HOLLINGER

The Hollinger Consolidated are planning to bring their daily milling capacity to 8,000 tons. Experiments already carried out at the mill make 8,800 tons daily appear quite probable. The "Northern Miner" (Cobalt) states that this capacity would indicate yearly net profits of $10,000,000 a year. A start is being made this month towards this increased tonnage, which will establish the Hollinger as the world's greatest gold mine in respect to gold production, in net profits and in tonnage treated. Assuring that 8,000 tons per day are handled, and assuming that grade of ore is set at $7.25 per ton average, and that complete costs are brought down to $3.75 per ton, a net profit of $3.50 per ton would be made on the 2,880,000 tons which would be treated yearly, making a net profit of $10,080,000. Hollinger capital is $24,600,000 issued and the indicated net earnings would therefore run a little over forty per cent. annually. It is thought that this rate may be obtained by the end of 1923.

VALUABLE ORE BODY AT TECK-HUGHES

A new ore body has been encountered at the Orr Gold Mines, recently acquired by Teck-Hughes Gold Mines, Limited, at a depth of about 400 feet, showing values ranging from $33 to $66 to the ton. In length the new body is about sixty feet, and there is every indication that it extends to considerable depth.

LORRAINE FIELD VERY PROMISING

Over a million ounces of silver have been produced in the South Lorraine field up to April 1st, and it is possible that by the end of the present year this new camp will be equalling Cobalt in silver output. So far, only two mines are producing, the Keeley and Mining Corporation, but work is going ahead rapidly in other holdings. What is believed to be the richest showing in native silver ever discovered in the world was made at the Keeley mine where at one place the vein averaged 7,390 ounces to the ton over a width of 4½ feet.

The first stoping operations carried out at the Mining Corporation disclosed an ore shoot ninety feet long, running from five to thirty inches wide, assaying from 3,000 to 8,000 ounces of silver to the ton. This Corporation is working three properties at present, the Crompton, Haileybury Silver, and Haileybury Frontier. South Lorraine is eighteen miles from Cobalt South.

CANADIAN PRODUCTS AT BRITISH INDUSTRIES FAIR

For the first time a Canadian section was introduced at the annual British Industries Fair, held in London in February. This section was organized by the Canadian Chambers of Commerce in London, and though but very modest, this was due to no lack of enterprise on the part of the Chamber. Although only six stands were occupied by individual firms, the number of Canadian manufacturers participating, assumed considerable dimensions owing to the Canadian National Railways and the Canadian Chamber of Commerce including in their display several articles supplied by manufacturers who had not leased space themselves. The Canadian Pacific Railways display, was one of the interesting features of the exhibition.

In addition to those displaying in the Canadian Section, several Canadian firms had displays in their particular trade section, including A. Booke Roberts & Co., London, showing carbon black, made by the Canada Carbide Company, at Shawinigan Falls, and acetic acid made by the Canadian Electro Products Co. of Shawinigan.

The attendance of visitors to the Fair was quite satisfactory, and an increasingly large number of inquiries were received.

DEVELOPMENT OF CALGARY IRON WORKS

At a recent meeting of the Calgary, Alberta, Board of Trade, Dr. M. C. Costello of the Calgary Iron Works stated that there was over half a million dollars invested in the iron and steel works and allied trades in Calgary, employing some 250 hands. The Calgary plants were all owned by Calgary men and had been the means of building up a large trade in Alberta. A large part of their trade was in mining equipment.

IN THE PULP AND PAPER INDUSTRY

The Belgo Paper Co., Shawinigan Falls, P.Q., have started up their No. 15 machine. The second day the machine made 59.5 tons of paper, and, evidently a disciple of Coue, it runs better and better every day, and in every way. The machine is driven by the Harland Interlock sectional electric drive, and is designed to run at a normal speed of 750 feet per minute. It started up at 600 feet.

BIG POWER DEVELOPMENT

The biggest development under way at the present time affecting the pulp and paper industry is the work of harnessing the power at the Grand Discharge, where the Saguenay River flows out of Lake St. John. It is estimated that this work will ultimately develop 1,500,000 H.P. within a radius of twenty-five miles of Chicoutimi. The work now under way will provide a first unit of 250,000 H.P., of which it is stated Price Bros. will take 200,000 for their Kenogami pulp mill. The work is being pushed vigorously by the Quebec Development Co. The building of the coffer dam was begun on January 8th, and is expected to be finished this month. It is 100 feet long by thirty feet high. It will divert one arm of the river and allow the building of a permanent dam to be carried out on the dry river bed.

CANADIAN PAPER AND PULP EXPORTS

Exports of newsprint during January amounted to 1,655,783 cwt., valued at $6,134,827. Of this, 1,354,024 cwt. were sent to the United States, 9,381 to New Zealand, 8,998 to Australia, and small quantities to the British West Indies and to South America. Of a total of 597,848 cwt. of groundwood exported during the same month, 226,462 went to the United Kingdom, and the remainder to the United States. The latter also absorbed the entire Canadian exports of sulphate pulp for the month, viz., 212,031 cwt. Of the 273,766 cwt. of bleached sulphite exported, Japan took 10,000 cwt., and the United States the balance.

F. J. D. Barnjum, who recently awarded $5,000 in prizes for the best treatise on the most practical methods of preserving Canadian timber from further destruction by the budworm and other insect pests, which have caused such great losses to our forests, is now offering $2,000 in prizes for the most convincing argument in favor of prohibiting the export of unmanufactured wood from Canada.

Robert O. Sweezey has compiled in some detail a mass of interesting facts and estimates of the valuable timber and water power resource of Quebec Province. The province is divided geographically into watersheds, and each one of them is treated separately. The thirty-page pamphlet can be obtained from Financial Services, Ltd., Montreal.

TO MANUFACTURE PAPER MAKING MACHINERY

The Armstrong Whitworth plant at Longueuil, P.Q., has been disposed of to Charles Walmsley & Co. (Canada) Ltd., who will manufacture paper making machinery and other products in this country. They have sold an issue of $1,000,000 of first mortgage bonds to a syndicate composed of Newman, Sweezy & Co., Dominion Securities Corp., and McLeod, Young, Weir & Co., Ltd., who will make public offering of the security. An unusual feature of the issue is the unconditional guarantee of interest and principal which has been given by the Sir W. G. Armstrong Whitworth Co., Ltd., of England, who control, through stock ownership, Charles Walmsley & Co., Ltd., of Bury, England, manufacturers of paper machinery.

CONTRACT AWARDED FOR DAMMING THE CHICOUTIMI

The contract for damming the Chicoutimi and Aux Sables Rivers in Kenogami, Lake St. John,

was awarded to the Nova Scotia Construction Co., of Montreal and Halifax, at $985,000. This tender was the lowest one received by the Running Streams Commission. According to the terms of the contract the work must be completed on the 1st of November, 1924. It is further stipulated that in the spring of 1924 the reservoir must be advanced sufficiently to reach 108 out of a total elevation set at 115. This has been added in the contract so as to allow the storing of the waters of the spring of 1924 in order to be ready for use in the fall of that year and during the winter of 1924-1925.

H. S. Taylor, Ltd., engineers, Montreal, have obtained an order to re-build the board mill of the Southern Novelty Co., Hartsville, South Carolina.

Students Visit Forest Laboratories

Mr. J. N. Stephenson, editor of the "Pulp and Paper Magazine of Canada" has just completed a series of four lectures on Pulp and Paper Manufacture to the senior students in chemical engineering at McGill University. These lectures were fully illustrated with lantern slides and covered the extent of the industry and the manufacture of the principal grades of pulp and paper. The las period was spent in a visit to the Forest Products Laboratories of Canada, where the students inspected the extensive exhibit of pulp and paper products and saw the experimental paper machine in operation. The staff of the Laboratories very kindly assisted in explaining the various points of interest.

The International Paper Co. are interested in the power development of Gres Falls, on the St. Maurice River a few miles above Three Rivers, which is now being carried out by the St. Maurice Power Co., a subsidiary of the Shawinigan Water and Power Co. The International Paper Co. are owners of La Gabelle Forges Rapids, which forms part of the development.

Paper Trade School For Three Rivers

It is authoritatively stated that the city of Three-Rivers, Que., has been chosen as the site for the erection of the paper school, legislative provision for which was made at the last session of the Quebec Legislature. The school will be operated under control of the Provincial Government, but the pulp and paper mill owners will co-operate to a large extent as the institution will supply them with experts within a short time. The construction of the school will start early this spring, and will be completed on time to be in full operation next fall.

The Canadian newsprint production for 1922 totalled 1,086,551 tons, which exceeds the 1921 production by 275,000 tons, and the former high record of 1920 by 211,000 tons. The exports for the year were 959,514 tons, an increase of 150,000 over the preceding year. Of this total, 887,835 tons went to the United States, and the balance to Great Britain and to South America.

Dryden Paper Co. Completing Large Extensions

The extensions to the Dryden Paper Co., Ltd. at Dryden, Ont. have been completed, including a power development at Wainwright Falls on the Wabingoo River, consisting of a concrete dam 300 feet long with 150-foot spillway, and a reinforced concrete and brick powerhouse. A 1,400 H.P. vertical shaft, single runner Morris turbine has been installed with a Moody diagonal flow runner made hy Dominion Engineering Works, Montreal. The turbine is connected to a 1,250 K.V.A. generator. The new mill extensions all of steel, reinforced concrete include: switchboard and motor room, building housing two synchronous motors, 450 H.P. each, and switchboard equipment; a grinder room, housing two Waterous three pocket grinders; a beater room, floor and basement containing groundwood screens, decker and wet machines, four Jones and one Waterous beater; a machine room equipped with one 130-inch Yankee paper machine.

An extension to the finishing room, 140 x 84 feet has been made, and a train shed of 6-car capacity and a pulp and chemical storehouse, 210 x 40 feet erected. The sulphate pulp plant has also been improved by an extension to the diffuser wash room building and the installing of two new diffuser wash tanks. The chemical recovery room has also been extended and a lime sludge filter installed. The capacity of the plant will now be 75 tons of sulphate pulp per day. Two-thirds of the production will go into wrapping papers and sulphate building papers.

Ill Health Removes Prominent Figure from Pulp Industry

The resignation of J. E. A. Duhuc from the committee of management and the board of the Ha! Ha! Bay Sulphite Co., and also from the board of the Saguenay Pulp and Power Co., owing to ill-health, removes the most outstanding figure among the French-Canadians in connection with the pulp and paper industry in the Province of Quebec. Mr. Dubuc had been connected with the Chicoutimi Pulp Co. for twenty-two years. In that time the mills of this company, situated on the Saguenay River, gradually developed until at the present time with an output of 110,000 tons of groundwood they rank as the largest in the world.

The recent visit of Sir Frederick Becker to Canada, it is understood, will result in his accepting the presidency of the Bay Sulphite Co. (formerly the Ha! Ha! Bay Sulphite Co.) and in further developments for this prosperous and growing producer of sulphite pulp. Practically the whole of the output of the mill (40,000 tons per annum) is exported to Great Britain and France.

Whalen Paper Interests Expand

It is reported that the Whalen Pulp and Paper Corporation, which has pulp mill interests in British Columbia, is planning to increase facilities for the production of newsprint. They have plants at Mill Creek and Swanson Bay, B.C.

ANNUAL MEETING, LIME ASSOCIATION

The Fifth Annual Convention of the National Lime Association will be held at the Hotel Commodore, New York City, June 13th, 14th and 15th, 1923.

The work of the convention will be devoted in a large measure to reports from the technical men of the research organization, and from the field engineers of the Association.

HEATONS ANNUAL, 1923 EDITION—Published by Heatons Agency, Toronto, Ont., 586 Pages—Price $2.50.

The nineteenth edition of Heaton's Annual, Commercial Handbook of Canada has come to hand. Every year each new edition has shown improvements and additions. The new edition is no exception. We notice particularly the Provincial Ready References which have been developed in this book. Here, under each province, is every point of economic interest in adequate paragraphs arranged in strictly alphabetical order. It is possible to turn up at a moment's notice any important point without consulting an index. Information of this kind is buried in blue books, the very existence of which is not known and which are inaccessible to the ordinary man who is not familiar with the cemetery.

The permanent features of the Annual, including the official directory for Dominion and Provincial governments, postal and telegraphic information, money exchange, insurance directory, income tax, transporattion and the Canadian customs have all been revised to date. The Annual also contains up-to-date descriptions of every commercial town in Canada, dealing with industries, census, population and other statistics invaluable in tables given at the end.

Heatons Annual is known as a standard authority on the Canadian Customs Tariff. It is in daily use by manufacturing and other business firms throughout Canada and the United States As a time saver its utility is well established.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST

Reported to Canadian Chemistry and Metallurgy, by A. E. MacRae, Ottawa

Note—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Decolorizing and Filtering Agent.—P. A. Boeck, 228861, Feb. 20, 1923. A decolorizing agent contains infusorial earth and fuller's earth in equal proportions by weight. The infusorial earth reduces the tendency to clogging and presents a larger surface of the fuller's earth.

Producing Nitric Acid by Means of the Electric Arc.—Dr. W. Siebert, 228883, Feb. 20, 1923. A N —O mixture is treated in an electric arc, the resulting gases are cooled, the nitric acid formed is absorbed and the unabsorbed gases are returned for further treatment when they are mixed with pure O and N to maintain a gas mixture containing 50% N. and 50% O. Apparatus is also specified.

Open Hearth Furnaces.—F. B. McKune, 228929, Feb. 20, 1923. Re-issue Can. Pat. 204114, C.A. 14, 21, 3217.

Securing Intimate Contact of Liquids and Gases in Ore Concentration.—R. P. Akins, F. D. Cross and J. Wm. Bucher, 228862, Feb. 20, 1923. Definite quantities of liquid and gas are respectively successively isolated and comingled and then released below the surface of a body of similar liquid. Apparatus is specified.

Chemical Concentration of Metals.—C. S. Bradley, 228783, Feb. 20, 1923. Metals of variable valency are extracted from ores by subjecting them to the combined action of SO_2 and a water solution of $CaCl_2$ in such excess as to maintain the resultant lower chlorid of the values in solution.

Methods of Operating Filters.—C. S. Bradley, 228,782, Feb. 20, 1923.

Chemical Filters.—C. S. Bradley, 228781, Feb. 20, 1923.

Methods of Treating Copper-Bearing Substances.—C. S. Bradley, 228780, Feb. 20, 1923. Cu- bearing materials are treated with a $CaCl_2$ solution to dissolve the Cu which is then precipitated as tryoxychloride by the addition of $CaCO_3$, which also regenerates the $CaCl_2$ for re-use.

Chloridizing Processes.—F. S. Low, 228735, Feb. 13, 1923. H and Cl are burned together in proximity to the material to be chloridized, i.e. Fe is removed from materials such as Cr, Fe ores or Al_2O_3 by this process with the production of HCl which is collected in aq. solution Apparatus is also specified.

Copper and Ore Concentrate.—C. S. Bradley, 228785, Feb. 20, 1923. The Cu content of ore is converted into $CuCl_23CuO$ which is reduced with lime and C at a température below the m.p. of Cu and the reduced Cu is heated in a fused $CaCl_2$ bath to fuse the Cu and free it from $CaCl_2$

Chemical Concentration of Ore Values.—C. S. Bradley, 228784, Feb. 20, 1923. A cyclic process is specified for extracting metals of variable valency from ores, in which solutions containing compounds of certain metals are used in the extraction and precipitation of other metals. See C. A. 11, 1395.

Separating Substances one from Another.—H. S. Hatfield, 228625, Feb. 6, 1923. Finely divided substances, solid or liquid are separated by the use of a suspension fluid the dielectric constant of which lies between those of the different substances. One or both of the electrodes in the electrostatic field may be liquid. A mixture of nitrobenzene and paraffin oil adjusted to give the required dielectric constant may be used and with fine suspensions it may be necessary to use an agent such as neat's

foot oil to produce deflocculation of the suspension. Apparatus is specified.

OXYGENATED COMPOUNDS OF TITANIUM AND PIGMENTS CONTAINING SAID COMPOUNDS.—G. Carteret and M. Devaux, 228641, Feb. 13, 1923.

PROCESS OF MAKING DIPHENYLGUANIDINE.—M. L. Weiss, 228725, Feb. 13, 1923.

CONCENTRATION OF SLUDGE ACID.—Wm. A. Slater, 228727, Feb. 13, 1923. Weak sludge acid from petroleum refineries is passed in counter current against a current of heated air to oxidize the impurities and concentrate the acid. Apparatus is also specified.

ELECTROLYTIC IRON.—F. A. Eustis, C. R. Hayward H. M. Schleicher and D. Belcher, 228618, Feb. 6, 1923. In making electrolytic Fe a solution containing ferric salts is reduced to produce a solvent of oxides of Fe consisting of a solution containing ferrous salts and a dilute acid, the oxide of Fe is dissolved in the solution and the Fe deposited by electrolysis leaving a ferric solution suitable for reduction. Also Patents Nos. 228615, 228616, and 228617.

PROCESSES OF TREATING ORE.—M. K. Codding, 228660, Feb. 13, 1923.

PHENOL CONDENSATION PRODUCT.—L. H. Bacheland and A. H. Gotthelf, 228557, Feb. 6, 1923. Phenol is mixed with paraldehyde or acetaldehyde in the presence of strong HCl and water is added. The product formed on heating is insol. and infusible up to 218° and melts at a higher temp. The product may be treated with a hardening agent such as formaldehyde paraform of hexamethylenetetramine.

MANUFACTURE OF LITHOPONE.—J. A. Singmaster and F. G. Breyer, 228581 and 228582, Feb. 6, 1923.

REDUCTION OF ORES.—W. E. F. Bradley, 228593. A hydrocarbon gas distilled from coal is used as a reducing agent for the ore. The coke is used to develop elec. power which is used to heat the ore.

PROCESS FOR THE GRADING OF ALKALINE EARTH CARBONATES.—W. W. Plowman and Wm. Feldenheimer, 228613, Feb. 6, 1923. Finely divided alkaline earth carbonates are mixed with a dilute aq. soln. of an alkaline silicate, the alkaline-earth carbonate suspension so formed is separated from any undeflocculated material and the carbonate is separated from the suspension by flocculation.

FILTER SCREENS.—A. T. Stuart, 228533, Feb. 6, 1923.

TREATING SLUDGE ACID.—I. Hechenbleikner and T. C. Oliver, 228562, Feb. 6, 1923. Sludge acids obtained in petroleum refining ore treated by passing hot air or gas through the acid while keeping the acid at a strength below the charring or coking pt. (47-57°Be) to eliminate the organic impurities and then subjecting the acid to further heat treatment to further concentrate it.

ARSENATE OF LEAD.—A. O. Allen, 228576, Feb. 6, 1923. $PbHAsO_4$ is prepared by pptg. the $Pb_3(AsO_4)_2$ from a basic soln. of the Pb salts of AcOH and HNO_3 the acids used in forming the soln. being 10 parts 70% AcOH to 1 part 40°Be HNO_3 with H_3AsO_4 of 58-63% As_2O_5 content, at a temp. of 120°.

MANUFACTURE OF LITHOPONE.—P. R. Croll, and F. G. Breyer, 228580, Feb. 6, 1923.

SASKATCHEWAN NEEDS ELECTRICAL POWER

n the Saskatchewan Legislature, D. A. McNiven M.L.A. for Regina, advocated the development of electrical power as a solution of that Province's industrial problems. He contended that the development of electrical power right at the coal fields by using coal as fuel and transmitting the power by long distance transmission lines was a real solution of the problem. There were fifty billion tons of coal in the Estevan coal fields, and Mr. McNiven believed that such a power development would eliminate seasonal occupation which was the chief drawback to Saskatchewan's development.

TESTING HYDROSULPHITE OF SODIUM

Since Messrs. Brotherton & Co., Limited, took over the English works of the Badische Co., they have carried out the manufacture of hydrosulphite almost to perfection. The compound is used so extensively and embraces so many different manufacturers' products that special attention to an easy method of estimation has been made by the firm's research chemists. The method given here is new and said to be very satisfactory.

As a result the following new method has been published by them and has been tested and found excellent as well as simple. Hydrosulphite is a product which varies greatly in strength according to the grade put out by the manufacturers and the care taken of packages by the buyer. The method here given will enable users to determine the best grade.

THE IODINE METHOD

Sodium hydrosulphite, in the presence of an excess of formaldehyde, breaks up into a mixture of sodium sulphoxylate formaldehyde ($NaHSO_2$, CH_2O, $2H_2O$) and sodium bisulphite formaldehyde ($NaHSO_3$, CH_2O, H_2O) according to the equation:

$$Na_2S_2O_4 + 2CH_2O + 4H_2O = NaHSO_2, CH_2O, 2H_2O + NaHSO_3, CH_2O, H_2O.$$

The following method for the estimation of sodium hydrosulphite is based on this fact.

Sodium bisulphite formaldehyde ($NaHSO_3$, CH_2O, H_2O) is not acted upon by iodine solution in neutral or acid solution.

Sodium sulphoxylate formaldehyde ($NaHSO_2$, CH_2O, $2H_2O$) reacts with iodine in neutral or acid solution, according to the following equation:

$$NaHSO_2, CH_2O, 2H_2O \times 41 = NaHSO_4 \times CH_2O \times 4HI.$$

It is clear, therefore, that the action of iodine on a solution of sodium hydrosulphite in excess of formaldehyde may be represented by the equation:—

$$Na_2S_2O_4, \quad 2CH_2O + 41 + 3H_2O = NaHSO_4 + 4HI + CH_2O + NaHSO_3, CH_2O, H_2O.$$

That is, one molecular weight of $Na_2S_2O_4$ reacts with 4 atoms of iodine or 40 litres of N/10 iodine solution.

40,000 cc. N/10 iodine = 174.1 grams $Na_2S_2O_4$.

1 cc. N/10 iodine = 0.004352 gr. $Na_2S_2O_4$.

This method of estimation is applied in the following way.

PREPARATION OF SOLUTION OF HYDROSULPHITE IN FORMALDEHYDE

The contents of a keg of hydrosulphite are apt to be shaken into layers of different strengths during transit. On this account a proper sampler should be used in taking an average sample o the keg. The contents of the sample bottle should be shaken before weighing out the 10 grams required for the analysis.

The 10 grams may be weighed out on an open watch glass if done rapidly. After some experience in weighing out this quantity of hydros (the name given to Brothertons' sodium hydrosulphite), it can be performed accurately in a few seconds.

The neck of a standard litre flask is cut off to within one inch of the graduation mark, and is provided with a well-fitting rubber stopper.

20 cc. of 40 per cent. formaldehyde is placed in the flask and distilled water is added, leaving room for another 50 cc. of water. The flask is shaken to mix the formaldehyde uniformly with the water. The liquid in the flask is given a whirling motion by rotating the flask, and 10 grams of the sample of hydrosulphite are poured into the flask down a dry funnel with a short stem. The funnel and watch glass are washed down rapidly with water, the volume made up to the mark, the stopper inserted, and the flask shaken vigorously. The whirling motion given to the liquid prevents the hydrosulphite sinking to the bottom and forming a cake. To get a uniform solution, it is necessary to shake the flask by repeatedly inverting it for five minutes, because of the small air space available for mixing the contents.

TITRATION—About 100 cc. of water are placed in a beaker, and 20 cc. of the hydrosulphite solution are added by means of a standard pipette; 50 cc. of N/10 iodine solution are added at once by a standard pipette. The light brown liquor is left for two minutes, and the excess of iodine is back titrated with N/10 thiosulphate solution with starch as indicator.

No precautions are necessary for the exclusion of air.

EXAMPLE—In each case 10 grams of the hydrosulphite and 20 cc. of 40 per cent. formaldehyde were dissolved in the litre standard flask. 20 cc. of this solution were taken for the titration, and 50 cc. N/10 iodine added as described above.

(a) 4.55 cc. N/10 thiosulphate required for the back titration.

(b) 4.60 cc. N/10 thiosulphate required for the back titration.

(c) 4.50 cc. N/10 thiosulphate required for the back titration.

Mean 4.55 cc. N/10.

Volume of iodine used up = 50 — 4.55 = 45.45 cc, which is equivalent to 45.45×0.004352 grs. hydrosulphite. This is contained in 20 cc. of the solution, in which 0.20 gr of the hydrosulphite was dissolved.

... Per cent of sodium hydrosulphite =

$$\frac{45.45 \times 4.352}{2}\$ = 98.9 \text{ per cent.}$$

A correction should be applied for the loss of hydrosulphite due to oxidation by dissolved air and by the small quantity of air in the flask below the cork before the formaldehyde has had time to act. In practice 1 per cent. will be found adequate.

COMPANY NOTES

DOMINION ENGINEERING WORKS—Much of the new business of Dominion Engineering Works came too late in 1922 to appear in the income statement for the year, and the earnings from new business were only slightly more than sufficient to meet the deficit in operating overhead from the business shortage in the early part of the year, according to the annual report. Total business during the year amounted to $2,800,000. The debit balance at the end of 1922 remains unchanged at $186,386. Assets total $8,774,154.

BRITISH EMPIRE STEEL CORPORATION, LIMITED—At the annual meeting of the Corporation held at Montreal March 21st, the authorized capital was reduced from $500,000,000 to $250,000,000. This includes a reduction from $100,000,000 to $60,000,000 in the 8 per cent. cumulative first preference stock; in the 7 per cent. cumulative second preference stock from $135,000,000 to $75,000,000; the 7 per cent. non-cumulative and preference stock, amounting to $15,000,000 is eliminated, while the common stock is reduced from $210,000,000 to $75,000,000. President Wolvin explained that the capital was set at a time when it was expected that it would be required to acquire the stocks of a number of enterprises which were not included in the final organization, and that $500,000,000 was greatly in excess of what would be required for a very long time. Business in 1922 had been most unsatisfactory, he said, particularly in the manufacture of steel products, railway cars and equipment and shipbuilding. The steel plant at Sydney Mines, N.S., was idle throughout the year, while the mills at New Glasgow operated at a minimum. The company produced 791,098 tons of iron ore at its Newfoundland mines during 1922 and shipped 724,862 tons to Germany and 278,109 tons to the Sydney mills. The Company's coal mines produced 4,254,874 tons of coal during 1922 as compared with 4,404,921 tons in 1921. Since January 1st this year up to March 17th, 1,165,760 gross tons of coal had been mined as compared with 732,613 gross tons for the same period last year. Owing to the coal shortage the company expect to successfully market its full coal production this year, and they had extensive plans under consideration for the extension of their coal markets in Ontario. Plans are also being made for the manufacture of coke suitable for

household use, as a substitute for N.S. anthracite coal in Ontario and Quebec.

The iron ore mines in Newfoundland have been operating all winter except for about two weeks, and despite the trouble in the Ruhr Valley in Germany there is reason to expect that this ore will be used in the Ruhr Valley mills in about the same quantity as last year. There are also reasonable prospects of marketing the ore in Great Britain and the United States.

The Eastern Car Company, subsidiary of the Corporation, is now running at practically full capacity. "If Canada," said Mr. Wolvin, "is favored with good crops this year and without serious labor difficulties, I would look forward to much better conditions in our affairs."

The new $10,000,000 issue of Price Bros. & Co., Ltd., first mortgage sinking fund 6% gold bonds due February 1, 1943, purchased by Harris Forbes & Co., Ltd., and offered simultaneously in Canada the United States and Great Britain, has been a very great success. An interesting aspect of the issue was the keen demand on the part of large Canadian institutional investors for blocks of the bonds.

CANADIAN WESTINGHOUSE COMPANY, LIMITED.

Net earnings for 1922 amounted to $742,195, and the year's business was considered satisfactory by the shareholders, especially in view of the depression prevailing during the first half of the year. The retiring members of the board were all re-elected as follows: H. H. Westinghouse, New York; Thomas Ahearn, Ottawa; Sir J. M. Gibson, K.C.M.G., Hamilton; F. A. Merrick, Hamilton; J. F. Miller, Pittsburg; Paul J. Myler, Hamilton; L. A. Osborne, New York; Warren Y. Soper, Ottawa; Charles A. Terry, New York; Gen. G. E. Tripp, New York.

The officers of the company were as follows: H. H. Westinghouse, Chairman of the Board; Paul J. Myler, President; L. A. Osborne, F. A. Merrick and N. S. Braden, Vice-Presidents; H. U. Hart, General Manager; W. E. Sprague, Secretary; George R. Kerr, Treasurer.

CANADIAN GENERAL ELECTRIC COMPANY.

Although the profit on 1922 operations showed a material reduction as compared with 1921, the balance sheet shows that the company is in a healthy and strong working condition. Current assets amount to $11,985,056, as compared with liabilities of $2,992,309, leaving a net working capital of $8,993,747, as compared with $5,385,410 in 1921, which is largely the result of a decrease in accounts and bills payable of nearly $6,000,000. Net profits for the year were $104,564, as compared with $706,092 in 1921. Drawings from surplus were made to pay the declared dividends. Little business was obtained during the first half of 1922, but a substantial increase was made in the final quarter, and during the first three months of 1923 a marked improvement is shown.

A. H. Winter Joyner, Limited, Toronto.—This company has been reorganized and in future will continue the business of representing companies manufacturing electrical specialties under the name of Powerlite Devices, Limited. Executives of the new company are:—M. B. Hastings, vice-pres.; A. V. Walker, treas., and S. E. File, Montreal manager.

The new company will represent Weston Electrical Instrument Co., The Bristol Co., General Devices and Fittings Co., and other electrical specialty manufacturing concerns. Their offices are at 62 Front Street West, Toronto.

STEEL COMPANY OF CANADA, LIMITED.

The annual statement of the Steel Company of Canada, Limited, Hamilton, Ontario, for the year, 1922, shows a deficit of $356,144. The demand for iron and steel during the first four months of 1922 was very poor, prices in many cases being below the cost of production. Business improved in May, but a serious setback occurred after July 1st by reason of the coal and railroad strikes in the United States. During the year several renewals were made to buildings and new equipment installed. This year, however, business has greatly improved, and the large works at Hamilton are working at full capacity. The very latest type of oven and equipment have been installed in the benzol plant, which is working most successfully.

LARGE CONTRACT AWARDED TO WESTINGHOUSE COMPANY.

The Canadian Westinghouse Company, Limited, has secured the contract for the generators for the Quebec Development Company's large power project at the outlet of Lake St. John, Quebec, into the Saguenay River. The equipment consists of eight 30,000 k.v.a., three phase 60 cycle, 13,200 volts, 112½ r.p.m. vertical generators, which will be connected with Allis-Chalmers water wheels. The Quebec Development Company consists of the R. B. Duke interests of North Carolina and Price Bros., of Quebec. The Westinghouse Company also supplied the 15,000 h.p. generator for the construction work at Lake St. John.

Another contract recently awarded to the Westinghouse Company was for four 33,000 k.v.a., three phase 60 cycle, 13,200 volts, 120 r.p.m. generators for the St. Maurice Paper Co.

CANADIAN PLANT OF FIRESTONE RUBBER CO. OPENS.

The new plant of the Firestone Tire and Rubber Company of Canada, Limited, Hamilton, Ont., is now operating at full capacity in two shifts.

The plant as it stands is one of the most modern tire factories on the continent. Practically all the equipment was supplied by Canadian firms or built in the plant itself. The operating personnel is largely Canadian. More than 300 Canadian workmen are now employed. The output is likewise a thoroughly Canadian product. Canadian mills are supplying all the raw material except the rubber, which is shipped from Singapore to Canada direct. Production is tires, exclusively cords, fabrics, solids and truck pneumatics.

The main building is reinforced concrete, four floors and basement.

All the machinery is operated by electricity—2,400 horse-power being utilized. The vulcanizers consume some 12,000 pounds of live steam an hour, piped from the Dominion Power and Transmission Company. This steam comes through the longest welded pipe line in Canada. The welds make a steam-tight line, preventing any waste. Every provision has been made for the comfort and safety of employees. The factory is unusually well ventilated with high ceilings that keep the temperature comfortable.

DWIGHT P. ROBINSON & CO., INC., OPEN PHILADELPHIA OFFICE.

The opening of a Philadelphia office is announced by Dwight P. Robinson & Company, Engineers and Constructors. The new office will be under the direction of Mr. Carl A. Baer, Member American Institute of Electrical Engineers, who was recently with the firm of Baer, Cook & Company, Engineers, and a consulting engineer in the design of industrial, textile and power plants.

Chemical Oil and Metal Market

CHEMICALS.

A marked improvement occurred in the heavy chemical market during March. Business specially improved during the latter half of the month and there is every prospect of a good spring trade in nearly all the industrial chemicals. Manufacturers of heavy acids in the United States are very busy and report some difficulty in making deliveries, and while Canadian acid plants are not rushed, at the same time they are operating at nearly full capacity with orders steadily increasing. Many lines show advanced quotations. Potassium permanganate is scarce, due to the manufacture having been stopped by the critical situation in the Ruhr Valley. Stocks are very small, and the price has advanced steadily. Arsenic also continues scarce, with prices again advanced to 16c per lb., or 15c per lb. in carloads. Calcium arsenate is firm at 22c per lb. Higher quotations are also noted on amyl acetate and oxalic acid, due to advanced costs of production and heavy demand. Potassium bichromate is another commodity very scarce at present, due to the increasing call for it both from domestic and foreign buyers. Barium compounds are firmer, the carbonate advancing $2 per ton and the nitrate ½c per lb. Manufacturers of salicylic acid announce increased prices in both the technical and B. P. grades, while there is an excellent demand for napthalene with higher prices on all grades. There is also an active market for phenol, but mostly in small quantities. Bleaching powder and Glauber's salt are two products always in steady demand on the Canadian market and production of both these chemicals is nearly at capacity. Trade in soda ash is specially good, both on contract orders and spot business. Prices on caustic soda continue steady at $5 to $5.50 per cwt. for the flake and ground and at $4.25 to $4.75 per cwt. for the solid. Higher price of copper is responsible for the firm position of copper sulphate, though there is no great demand just now. Acetic acid, wood alcohol and formaldehyde prices keep firm with a steadily improving business in these lines every week. Practically the only product showing a decline in price is sodium prussiate, which has eased off ¼c per lb. The strong position of the chemical market as a whole is shown by the fact that during the last week in March not a single product showed a decline, while during the first week in April only one declined, sodium prussiate, as mentioned.

Advances—The following have advanced the amounts noted: Barium nitrate, ½c per lb.; Barium carbonate, $2 per ton; ammonium chloride, ¼c per lb.; ammonium sulphate, ¼c per lb.; lithophone, 1c per lb.; caustic potash, ¼c per lb.; oxalic acid ¼c per lb.; potassium bichromate, ½c per lb.; caustic potash, ¼c per lb.; potassium permanganate, 3c per lb.

METALS.

After steadily advancing in price during the past two months lead and zinc have declined, quotations on lead in carlots running on April 9th at $7.55 per cwt., as compared with $7.85 of the same date a month previous. Zinc has also declined 30c per cwt. So far as the Canadian market goes, however, both zinc and lead are in a strong position. A splendid export business is being built up by Canadian producers with British and European buyers. The present duty imposed by the United States on imports of lead and zinc is believed by many to be far too high, and is resulting in American producers losing a great deal of export business. This loss of export trade has been responsible largely for the decrease in quotations.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals and Industrial Minerals.

Inorganic.

Alum, Ammonia, lump or ground	100 Lbs.	4.50— 5.00
Ammonium Bromide	Lb.	.. — .28
Aluminum Sulphate, lump, bags	Cwt.	2.25— 2.50
Aluminum Sulphate, ground, bags	Cwt.	2.50— 2.75
Aluminium Sulphate, iron free	Cwt.	.. — 4.00
Ammonia, Aqua, 26, Carboys	Lb.	.13— .14
Ammonia, Aqua, 26, Drums	Lb.	.. —.09½
Ammonium Carbonate	Lb.	.12— .15
Ammonium Chloride	Lb.	.10— .13
Ammonia Iodide	Lb.	.. — 6.25
Arsenic	Lb	.15— .17
Barium Sulphate (Barytes)	Per Ton	30.00—35.00
Barium Chloride	Lb.	.06— .08
Barium Nitrate	Lb.	.. — .16
Barium Peroxide	Lb	.. — .26
Barium Sulphate, B.P.	Per Ton	60.00—60.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	Lb.	2.50— 3.00
Borax, crystals	Lb.	.06¾— .07
Boric Acid	Lb.	.. — .13
Bromine (technical)	Lb.	.. — .38
Calcium Acid Phosphate	Lb.	.. —.07½
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —95.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	..—100.00
Calcium Chloride, fused	Per Ton	.. —31.00
Calcium Chloride, flake	Ton	44.00—48.00
Caustic Soda, flake, drums	Cwt.	5.00— 5.50
Caustic Soda, ground, drum	Cwt.	5.00— 5.50
Caustic Soda, solid, drum	Cwt.	4.25— 4.75
Camphor Monobromate	Lb	.. — 3.00
Carbon Bisulphide, in drums	Lb.	.12— .13
Carbon Tetrachloride, drums	Lb.	.. — .15
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, Canadian, f.o.b. Huberdeau, Que., car lots	Ton	17.00—18.00
China Clay, imported	Per Ton	20.00—25.00
Cobalt Oxide, black	Lb.	.. — 2.00
Cobalt Oxide, grey	Lb	.. — 2.25
Copperas (Iron Sulphate) crystals	Lb.	.02—.02¼
Copperas (Iron Sulphate) sugar	Lb.	.02—.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.08—.08¼
Corrosive Sublimate (Mercuric Chloride)	Lb.	1.15— 1.20
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	.. —30.00
Ferric Chloride, crystals	Lb.	.13— .14
Ferric Chloride, solution	Lb.	.. — .10
Hydrofluoric Acid, 60%	Lb.	.22— .25
Hydrofluoric Acid. 30%	Lb.	.11— .13
Hydrochloric Acid, carboys, 18	100 Lbs.	2.25— 2.75
Hydrogen Peroxide	Gal.	.70— .75
Iodine, crude	Lb.	4.50— 4.75
Iodine, resublimed	Lb.	5.50— 5.60
Iron Oxide (red)	Lb	.05— .13
Lead Acetate	Lb.	.14— .16
Lead Nitrate	Lb.	.14 — 15
Lime, grey	Ton	.. —14.30
Lime, grey, in car lots	Ton	.. —11.70
Lime (hydrated) in ton lots	Ton	.. —20.00
Litharge	Lb.	.09— 10
Lithium Carbonate	Lb.	1.80— 2.10
Lithopone	Lb.	.. —.07½
Magnesite, calcined	Per Ton	.. —30.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl	Lb.	.14— .16
Magnesium Sulphate	Lb.	.03½—.04½
Mag. Sulphate, B.P., Medicinal	Single Ton	60.00—70.00
Mag. Sulphate, Technical, car lots	Ton	45.00—50.00
Mica, ground, f.o.b. Hull, Que.	Ton	.. —60.00
Muriatic Acid, 18	100 Lbs.	2.25— 2.75
Nickel Salt, single, in bbl. lots	Lb.	.. —.13½
Nickel Salt, single, per cwt.	Lb.	.. — .15
Nickel Salt, double, barrel lots	Lb	.. — .14
Nickel Salt, double, per cwt.	Lb.	.. —.15½
Nitric Acid, 36 carboys	100 Lbs.	8.75— 9.00
Phosphoric Acid, 85%	Lb.	.. — .28
Phosphoric Acid, 50%	Lb.	.. — .22
Phosphorus, yellow	Lb.	.. — .34
Potash Prussiate, yellow	Lb.	.32— .34
Potassium Bicarbonate	Lb.	.. — .20
Potassium Bromide, crystals	Lb.	.28— .34
Potassium Bromide, granular	Lb.	.28— .34
Potassium Bichromate	Lb.	.17— .18
Potassium Carbonate, calc. 80%-85%	Lb.	.. — .11
Potassium Chlorate	Lb.	.. — .10
Potassium Citrate	Lb.	.90— 1.00
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .45
Potassium Hydroxide (caustic potash) small drums	Lb.	.10— .15
Potassium Hydroxide (caustic potash) large drums	Lb.	.09— .10
Potassium Iodide	Lb	.. — 4.40
Potassium Nitrate, casks	Lb.	.10— .12
Potassium Permanganate, bulk	Lb.	.19— .20
Red Precipitate (Mercuric Oxide)	Lb.	.. — 1.75
Silver Nitrate	Lb.	.. — 9.00
Soda Ash, bags	Cwt.	2.25— 2.40
Sodium Acetate, ton lots or over	Lb.	.. — .08
Sodium Acetate, lesser amounts	Lb.	.. —.08½
Sodium Aluminium Phosphate	Lb.	.. —.03½
Sodium Benzoate	Lb.	.60— .85
Sodium Bicarbonate, 100% pure	Lb.	2.50— 3.00
Sodium Bichromate, bbls.	Lb.	.10— .13
Sodium Bisulphite, powder	Lb.	.05¼— .06
Sodium Bisulphite, 35 Be.	Lb.	.03—.03¼
Sodium Bromide (foreign)	Lb.	.. — .28
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. — .34
Sodium Fluoride, 95-98%	Lb.	.15— .16
Sodium Hyposulphite, kegs	100 Lb.	4.75— 5.00
Sodium Hyposulphite, barrels	Cwt.	4.00— 4.50
Sodium Iodide	Lb.	.. — 4.90
Sodium Nitrate, refined	Cwt.	6.75— 7.00
Sodium Nitrate, crude, 95%	Cwt.	5.25— 5.75
Sodium Nitrite	Lb	.12— .15
Sodium Perborate, U.S.P.	Lb.	.35— .40
Sodium Peroxide, f.o.b. New York	Lb.	.30— .35
Sodium Silicate, 42°, car lots	Cwt.	.. — 1.35
Sodium Silicate, 42°, smaller lots	Cwt.	.. — 1.55
Sodium Silicate, 40°, car lots	Cwt.	.. — 1.25
Sodium Silicate, 40°, smaller lots	Cwt.	.. — 1.45
Sodium Sulphide, 60-62% fused	Lb.	.08— .09
Sodium Sulphate (Glauber's Salts) crystals,	Per Cwt. in Bags	1.80— 2.00
	Per Cwt. in Car Lots	1.65— 1.70
Sodium Sulphite	Lb.	.. — .05
Sodium Prussiate, Yellow	Lb	.24— .25
Sulphur, ground	100 Lb.	2.50— 2.75
Sulphur, roll	100 Lb.	4.25— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.25— 2.75
Sulphuric Acid, 66 Be, tank cars, f.o.b. Toronto,	Ton	23.75—24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —23.00
Tin Chloride crystals	Lb.	.30— .35
Tri-sodium Phosphate	Lb.	.07—.07½
Ultramarine, Blue	Lb.	.10— .29
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 1.85
Whiting (English)	Ton	.. —30.00
Whiting (American)	Ton	.. —28.00
Zinc Sulphate, com.	Lb.	.05—.05½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.11— .12
Zinc Stearerate	Lb.	.30— .35

Organic.

Acetanilid, C. P.	Lb.	.45— .50
Acetic Acid, glacial, barrels, f.o.b. Shawinigan Falls,	Lb.	.. — .12
Acetic Acid, glacial, carboys, f.o.b. Shawinigan Falls,	Lb.	.. —.12½
Acetic Acid, glacial, bbls., car lots, fo.b. Shawinigan,	Lb.	.. — .16
Acetic Acid, 28%, carload lots	100 Lb.	.. — 4.80
Acetic Acid, 28%, 25 bbl. lots	100 Lb	.. — 5.05
Acetic Acid, 28%, 10 bbl. lots	100 Lb.	.. — 5.30
Acetic Acid, 28%, 5 bbl. lots	100 Lb.	.. — 5.55
Acetic Acid, 28%, 1 or 2 bbl. lots	100 Lb.	.. — 5.80
Acetic Acid, 80%, carload lots	100 Lb.	.. —13.20
Acetic Acid, 80%, 25 bbl. lots	100 Lb.	.. —15.20
Acetic Acid, 80%, 15 bbl. lots	100 Lb.	.. —16.20
Acetic Acid, 80%, 10 bbl. lots	100 Lb.	.. —16.75
Acetic Acid, 80%, 5 bbl. lots	100 Lb.	.. —17.20
Acetic Acid, 80%, 3 or 4 bbl. lots	100 Lb.	.. —18.20
Acetic Acid, 80%, 1 or 2 bbl. lots	100 Lb.	.. —18.50
Acetone, pure, drums or over	Lb.	.. — .27
Acetone, pure, lesser amounts	Lb.	.. — .34
Aspirin, in 100-lb. lots, bulk	Lb.	.75— .95
Alcohol, Absolute Ethyl, case of 1 doz.	1-lb. bottle	.. — 3.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —23.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.15
Alcohol, acetone, lesser amounts	Gal.	.. — 1.45
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.20
Alcohol, wood, 97%, half bbl. lots	Gal.	.. — 1.35
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 1.50
Aldehyde Ammonia	Lb.	.. — .75
Amyl acetate, technical	Gal.	.. — 4.00
Amyl Acetate, pure	Lb.	.. — .80
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.85 — .90
Caffeine, English	Lb.	.. — 3.50
Calomel (Mercurous Chloride)	Lb.	1.50— 1.60
Camphor, refined, slabs	Lb.	.. — 1.28
Camphor, refined, tab	Lb.	.. — 1.32
Carbolic Acid, white crystals	Lb.	.38— .40
Chloroform	Lb.	.45— .55
Citric Acid, domestic, crystals	Lb.	.45— .55
Coumarin	Lb.	3.00— 3.50
Cream Tartar, 98%	Lb.	.25— .30
Dextrine, potato	Lb.	.. — .06
Dextrine, corn	Lb.	.. —.08½
Ether, B.P. (conc.)	Lb.	.. — .55
Ether, Sulphuric	Lb.	.30— .35
Formaldehyde, bbls. or over	Lb.	.. —.19½
Formaldehyde, 200-lb. kegs	Lb	.. —.24½
Formaldehyde, 100-lb. kegs	Lb.	.. —.25½
Formaldehyde, 50-lb. kegs	Lb.	.. —.26½
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special, refined	Gal	4.00— 4.50
Gallic Acid	Lb.	1.25— 1.75
Glycerine, crude, drums	Lb.	.. — .15
Glycerine, crude, single tin of 56 lbs.	Lb.	.. — .17
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .29
Glycerine, C.P., two or more tins	Lb.	.. — .27
Glycerine, (pale straw), single tin 56 lbs.	Lb.	.. — .28
Glycertine, (pale straw), two or more tins	Lb.	.. — .26

Glycerine, C.P. drums, 500-1,000 lbs.	Lb.	.. — .21
Glycerine, pale straw, drums, 500-1,000 lbs.	Lb.	.. — .20
Hexamethylenetetramine		.. — .85
Oxalic Acid	Lb.	.18— .20
Oleic Acid	Lb.	.. — .26
Phenacetin	Lb.	1.75— 2.00
Phenolphthalein	Lb.	.. — 1.50
Pyrogallic Acid	Lb.	2.00— 2.10
Quinine	Oz.	.70— .75
Saccharin	Lb.	1.75— 2.25
Salicylic Acid	Lb.	.. — .50
Starch, corn, ground, car lots	Lb.	.. —.04¼
Starch, potato, ground, car lots	Lb.	.. —.08½
Stearic Acid, Double Pressed	Lb.	.22— .24
Stearic Acid, Triple Pressed	Lb.	.25— .27
Tartaric Acid, crystals or powdered	Lb.	.. — .38
Tannic Acid, commercial	Lb.	.45— .65

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .12
Hydrochloric Acid, C.P.	Lb.	.. — .14
Nitric Acid, C.P.	Lb.	.. — .22
Sulphuric Acid, C.P.	Lb.	.. — .13

Industrial Gases.

Acetylene, cylinders	per 100 cu. ft.	2.55— 3.00
Coal Gas, cylinders	per 100 cu. ft.	3.00— 4.00
Hydrogen, cylinders	per 100 cu. ft.	1.50— 2.00
Nitrogen, cylinders	per 100 cu. ft.	2.00— 3.00
Oxygen, cylinders	per 100 cu. ft.	1.50— 2.00

Fertilizer Materials.

Acid Pbospbate	Ton	28.00—30.00
Animal Tankage, per unit of Ammonia		.. — 3.50
Animal Tankage, per unit of Bone Pbospbate of lime		.. — .10
Nitrate of Soda		65.00—70.00
Muriate of Potash	Ton	.. —40.00
Pure Ground Blood, per unit of Ammonia		.. — 4.00
Steamed Bone Meal	Per Ton	.. —30.00
Sulphate of Ammonia	Ton	68.00—70.00

Tanning and Dyeing Material

Fustic Crystals	Lb.	.26— .30
Hematine Crystals	Lb.	.18— .22
Logwood, Solid	Lb.	.18— .22
Quercitron Liquid Extract	Lb.	.07— .08
Liquid Sumac Extract	Lb.	.08— .09
Ground Sumac	Ton	65.00—70.00
Chestnut Liquid Extract	Lb.	.02½—.03½
Hemlock Liquid Extract	Lb.	.03½— .04
Quebracho Liquid Extract	Lb	.03—.03½
Quebracho Solid Extract	Lb.	.04¾—.05½

Essential and Vegetable Oils, Gums, Wax

Essential Oils—

Anise Oil	Lb.	.. — .80
Cedar, leaf	Lb.	1.90— 2.00
Cedar, wood	Lb.	.. — .80
Camphor	Gal	.. — 1.10
Camphor, wbite	Lb.	.90— 1.10
Peppermint, American	Lb.	4.00— 4.25
Peppermint, re-distilled, B.P.	Lb.	4.00— 4.25
Peppermint, Japanese	Lb.	1.75— 2.00

Vegetable Oils—

Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulpbonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.15— .17
Corn Oil, in bbls.	Lb.	.. — .12
Corn Oil, tank cars	Lb.	.10—.10½
Cottonseed Oil, crude, f.o.b. U. S. mills, tanks	lb.	.10— .10
Summer yellow, bbl.	lb.	.12—.12¼
Winter yellow, bbl.	lb.	.13—.13¼
Linseed Oil, 1 to 2 bbls., Raw, per gal. of 9 lbs.		.. — 1.25
3 to 5 bbls., Raw, per gal. of 9 lbs.		.. — 1.24
6 to 9 bbls., Raw, per gal. of 9 lbs.		.. — 1.22
Linseed Oil, boiled, 3c per lb. bigber than raw		
Monopole Oil	Lb.	.07— .16
Olive Oil, foots, at Toronto	Lb.	.12— .14

Gums—

Indian, No. 1A	Lb.	.. — .28
Indian, No. 1	Lb.	.. — .25
Tragacantb, No. 1, Ribbon	Lb.	.. — 3.00
Tragacantb, No. 1, Flake	Lb.	.. — 2.00
Tragacanth, Turkey	Lb.	.. — 2.00
Arabic, clear amber sorts	Lb.	.. — .22
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .30
Arabic, regular grain No. 2	Lb.	.. — .31
Arabic, wbite sorts	Lb.	.. — .35
Arabic, powdered, No. 1	Lb.	.. — .40
Arabic, powdered, No. 2	Lb.	.. — .39

Waxes—

Paraffin, 128°—130°, M.P., 250 lb. lots	Lb.	.. — .06
Paraffin, 118°—120°, M.P., 250 lb. lots	Lb.	.. — .05
Parowax, blocks, 100 lb. lots	Lb.	.. —.08¾

Cernauba.

No. 1	Lb.	.. — .50
No. 2	Lb.	.. — .42
No. 3, Chalky	Lb.	.. — .21
North Country, No. 2	Lb	.. — .32
North Country, No. 3	Lb.	.. — .22

Ceresin.

White	Lb.	.. —.12¼
Yellow	Lb.	.. — .12
Montan	Lb.	.06— .07
Candelilla	Lb.	.40— .42
Japan	Lb.	.19— .20

Beeswax.

White, pure	Lb.	.. — .38
African, bags	Lb.	.. — .30
Brazilian	Lb.	.. — .34
Chilean	Lb.	.. — .35
Refined	Lb.	.. — .31

Shellacs.

T.N.	Lb.	.. — .90
Superfine Orange	Lb.	.83— .85
A. C. Garnet	Lb.	.. — .82
Bone Dry	Lb.	.. — .99

Crude Rubber.

The following quotations on Rubber are in American funds, New York delivery:—

Para, upriver fine	lb.	.33—.33½
upriver, coarse	lb.	.27½ .28
Caucho ball	lb.	29½ .30
Plantation, 1st latex crepe	lb.	.35½—.35¾
Ribbed smoked sheets	lb.	.35½—.35¾
Brown crepe, thin, clean	lb.	.31— .32
Amber crepe, No. 1	lb.	.31— .32

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .29
Motor Gasoline (service stations)	Gal.	.. — .33
Ligbting Gasoline	Gal.	.. — .34
Naphtha	Gal.	.. — .28
Coal Oil	Gal.	.. — .21
Fuel Oil, bbls.	Gal.	.. — .11
Fuel Oil, tank cars	Gal.	.. — .09
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.85
Pennsylvania, Crude (42 W. gal.)	Bbl.	.. — 4.00
Crude Creosote Oil, bbls.	Gal.	.. — .40
Refined Creosote Oil. bbls.	Gal.	.. — .60
Crude Coal Tar	Bbl.	.. —10.25
Refined Coal Tar	Bbl.	.. —11.50
Coal Tar Pitch, bbls.	Cwt.	.. — 2.00
Benzol, 100%	Imp. Gal.	.. — .65
Benzol, 90%	Imp. Gal.	.. — .60
Refined Solvent Naphtba	Gal.	.. — .48
Pure Toluol	Gal.	.. — .52
Dip Oil, 20 per cent. (at New York)	Gal.	.24— .26
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .30
Naphtbalin flake	Lb.	.. — .08
Naphthalin balls	Lb.	.. — .09
Alpba-Napbylamin	Lb.	.. — .51

Flotation Oils and Naval Stores.

Rosin, Grade G, in 280-lb. bbl. lots		.. — 9.50
Rosin, Grade W. W., in 280-lb. bbl. lots		.. —11.50
Turpentine, 1 bbl. lots	per Imp. gal	.. — 2.25
2 to 4 bbl. lots	per Imp. gal.	.. — 2.24
5 gallon lots	per Imp. gal.	.. — 2.40

Metals.

Aluminium, 98-99%, 15 ton lots	Lb.	.. — .22
Antimony	Lb.	.. —.09¾
Brass, yellow ingots	Lb.	.. — .12
Brass, red	Lb.	.. —.16½
Brass, rods	Lb.	.. — .19
Cobalt, metal	Lb.	3.00— 3.25
Copper, electrolytic, small lots	Cwt.	.. —19.25
Copper, electrolytic, car lots	Cwt.	.. —18.75
Copper, casting, small lots	Cwt.	.. —18.25
Copper, casting, car lots	Cwt.	.. —17.75
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —34.00
Lead, Pig, small lots	Cwt.	.. — 7.85
Lead, Pig, car lots	Cwt.	.. — 7.35
Magnesium, ribbon	Oz.	.. — 1.50
Magnesium, ribbon	Lb.	.. —18.00
Magnesium, powder	Oz.	.60— .65
Monel Metal, macbined rods	Lb.	.. — .50
Monel Blocks	Lb.	.. — .34
Monel Metal, shot	Lb.	.. — .34
Monel Metal, sheet, hot rolled, on orders of over five hundred pounds, of one gauge	Lb.	.. — .48
Monel Metal, rods, bot rolled	Lb.	.. — .42
Monel Metal, rods, cold rolled	Lb.	.. — .53
Nickel, shot or ingot	Lb.	.. — .35
Platinum, pure	Oz.	..—124.00
Platinum, 5% iridium	Oz.	..—128.00
Platinum, 10% iridium	Oz.	..—138.00
Silver, bar, American silver	Oz.	.. —.99¼
Silver, bar, Canadian produced, U.S. funds	Oz.	.. —.67¼
Steel, mild, ¼ incb, base price	Cwt.	.. — 3.35
Steel, mild, 3/16 incb, base price	Cwt.	.. — 3.85
Steel, nickel, in bars, 3½% nickel	Lb.	.. — .20
Steel, sheet, 28 gauge, size 30"	Cwt.	.. — 5.50
Steel, sheet, 28 gauge, size 36"	Cwt.	.. — 5.45
Steel, sbeets, galvanized, 28 gauge, 30"	Cwt.	.. — 6.75
Steel, sheets, galvanized, 28 gauge, 36"	Cwt.	.. — 7.00
Tin	Lb.	.. — .54
Zinc, sheets	Lb.	.. — .13
Zinc (spelter) small lots	Cwt.	.. — 9.50
Zinc (spelter) car lots	Cwt.	.. — 9.00

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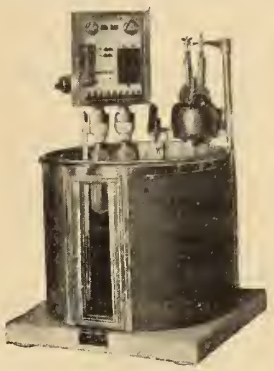

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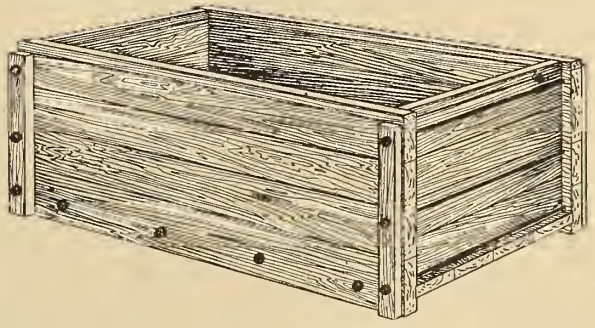

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Manufacturers and Dealers Listed Here are the Principal Ones Serving Canadian Chemists and Industries Under Chemical Control

Special contracts for Buyers' Guide and Directory Listings may be secured. Company name and address and any number of items listed here per annum. Write Advertising Manager of Canadian Chemistry and Metallurgy for Buyers' Guide rates. These are very reasonable.

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Standard Chemical Co., Montreal.

Acetone and Acetates—
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Lymans, Ltd., Montreal.

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Hoyt Metal Co., Eastern Ave., Toronto.

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Hoyt Metal Co., Eastern Ave., Toronto.

Acid Resisting Pipe and Valves—
Hoyt Metal Co., Eastern Ave., Toronto.

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Canadian Industrial Alcohol Co., Montreal, Canada.

Alcohol—Ethyl or Grain—
Canadian Industrial Alcohol Co., Montreal.

Alcohol—Methyl or Wood—
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Alum, Paper Makers'—
Nichols Chemical Co., Toronto and Montreal.

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Cosmos Chemical Co., Port Hope, Ont.

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Stillwell Laboratories, 76½ Pine Street, New York.

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Eimer & Amend, 3rd Ave., 18th to 19th Sts., New York, N.Y.
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Arthur H. Thomas Co., West Washington Sq., Philadelphia, Pa.

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Canadian Salt Co.. Windsor, Ont.

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Engineering & Machine Works of Canada, Ltd., St. Catharines, Ont.

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Westman Press, Ltd., 57 Queen Street W., Toronto.

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Imperial Trading Co., Montreal.
Winn & Holland, Ltd., 137 McGill Street, Montreal.

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Blair, Campbell & McLean, Ltd., Woodville Street, Glasgow, Scotland.

Brimstone—
Union Sulphu Co., 17 Batterry Place, New York, N.Y.

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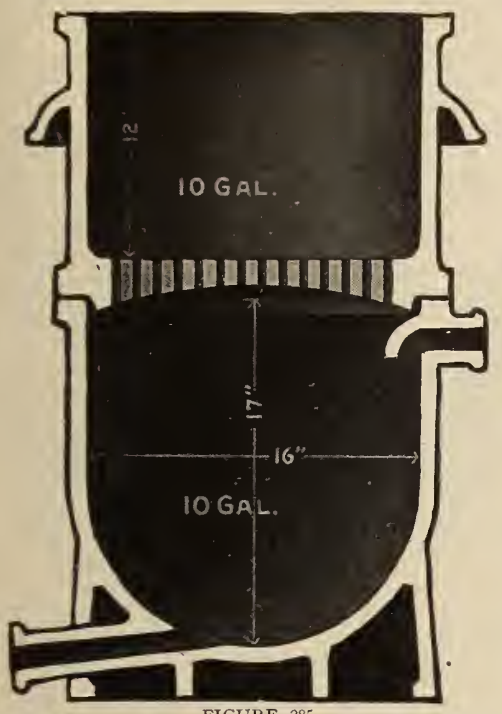

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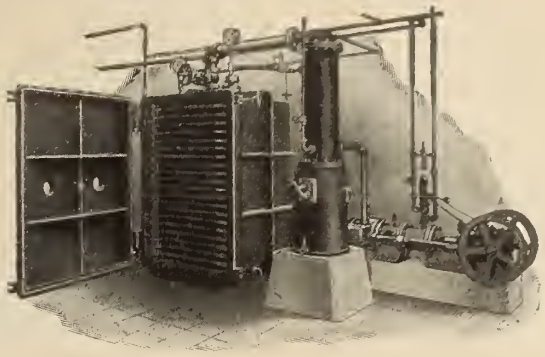

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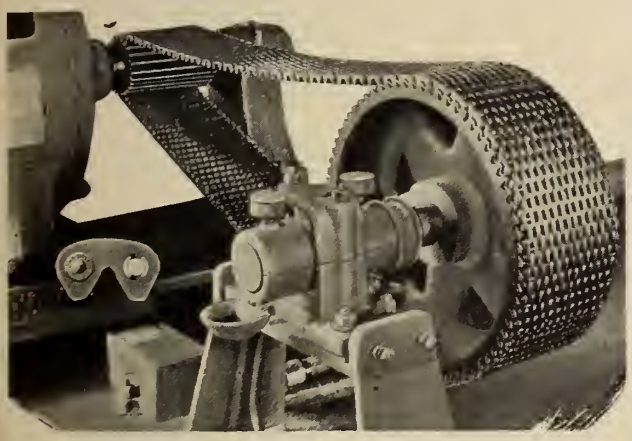

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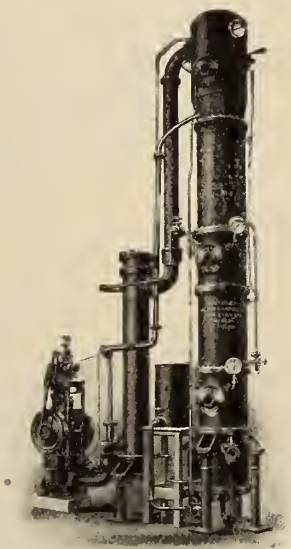

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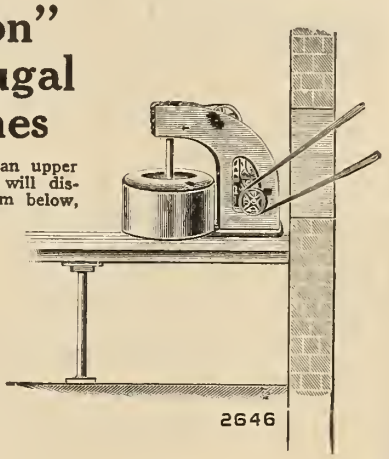

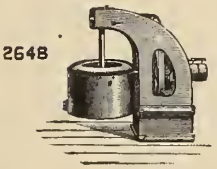

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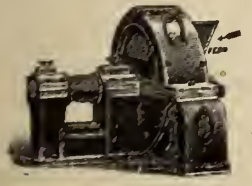

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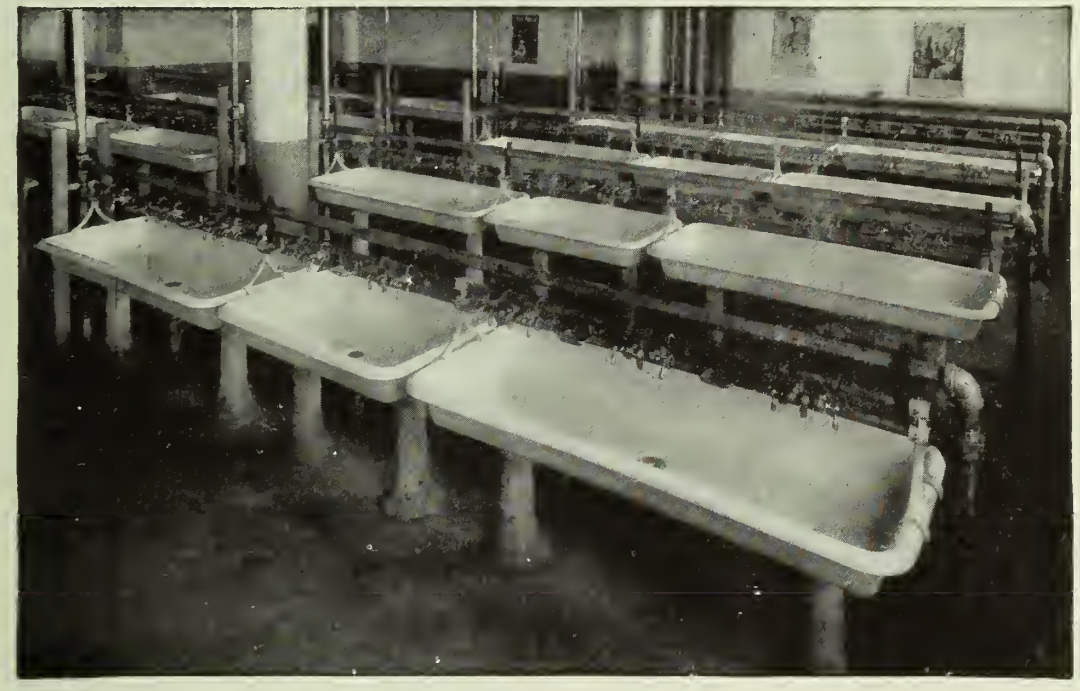

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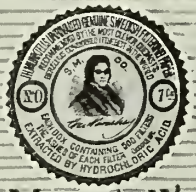

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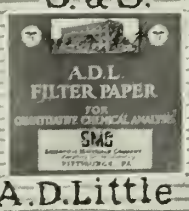

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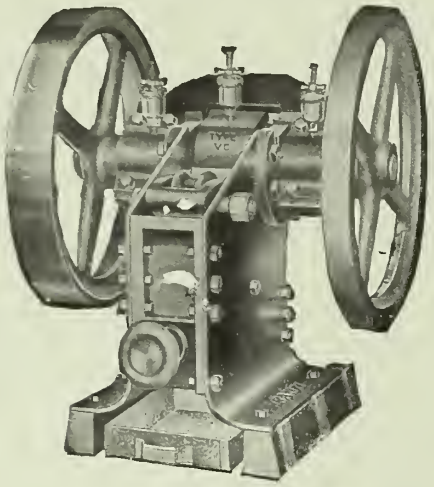

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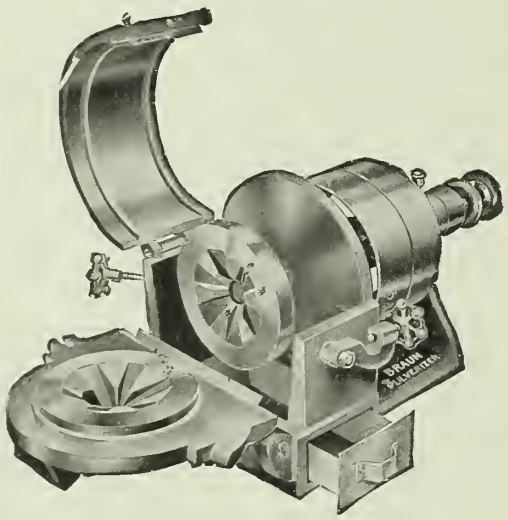

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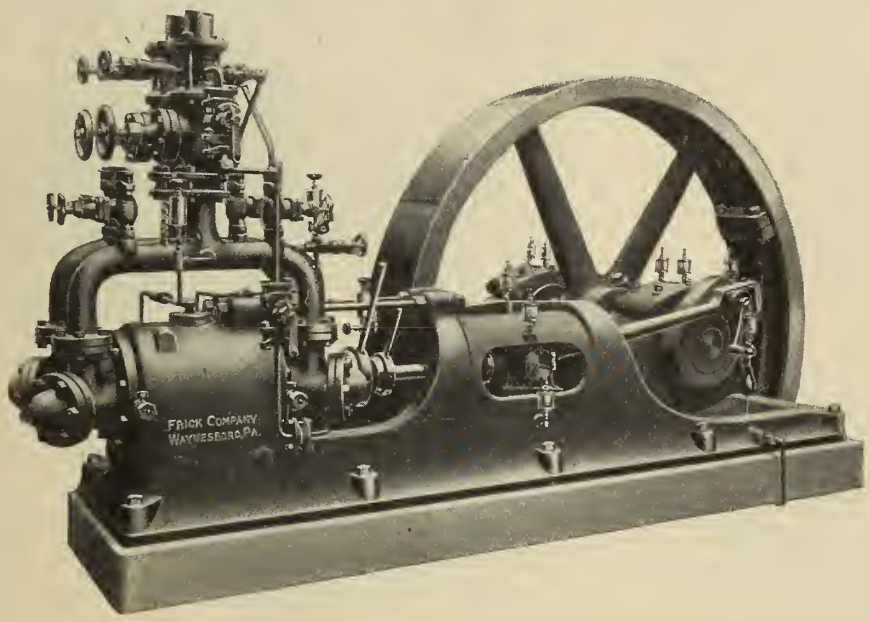

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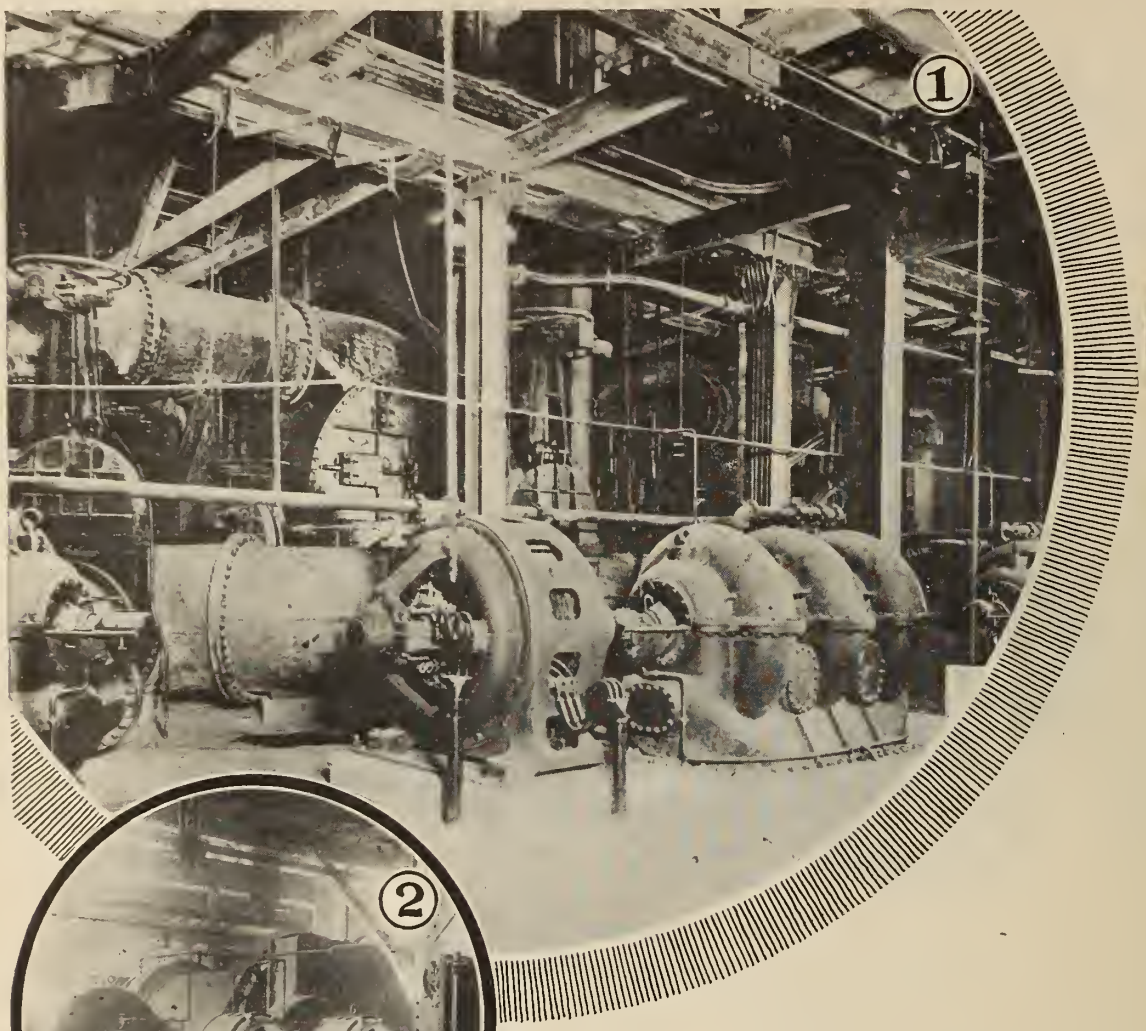

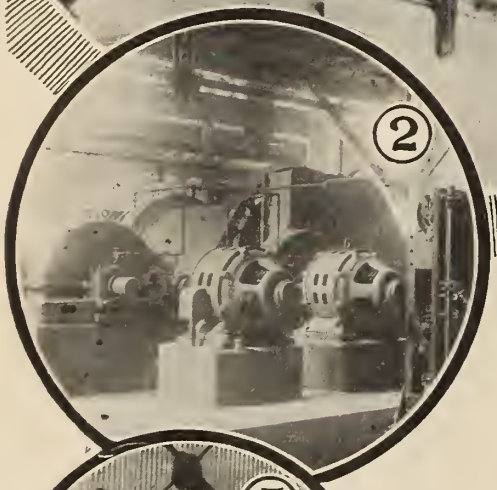

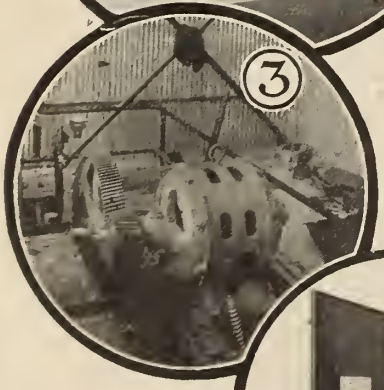

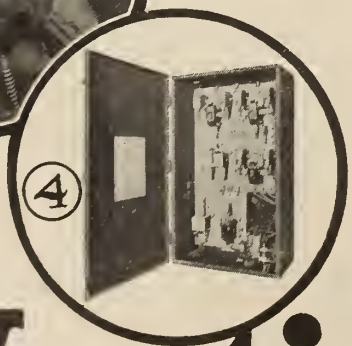

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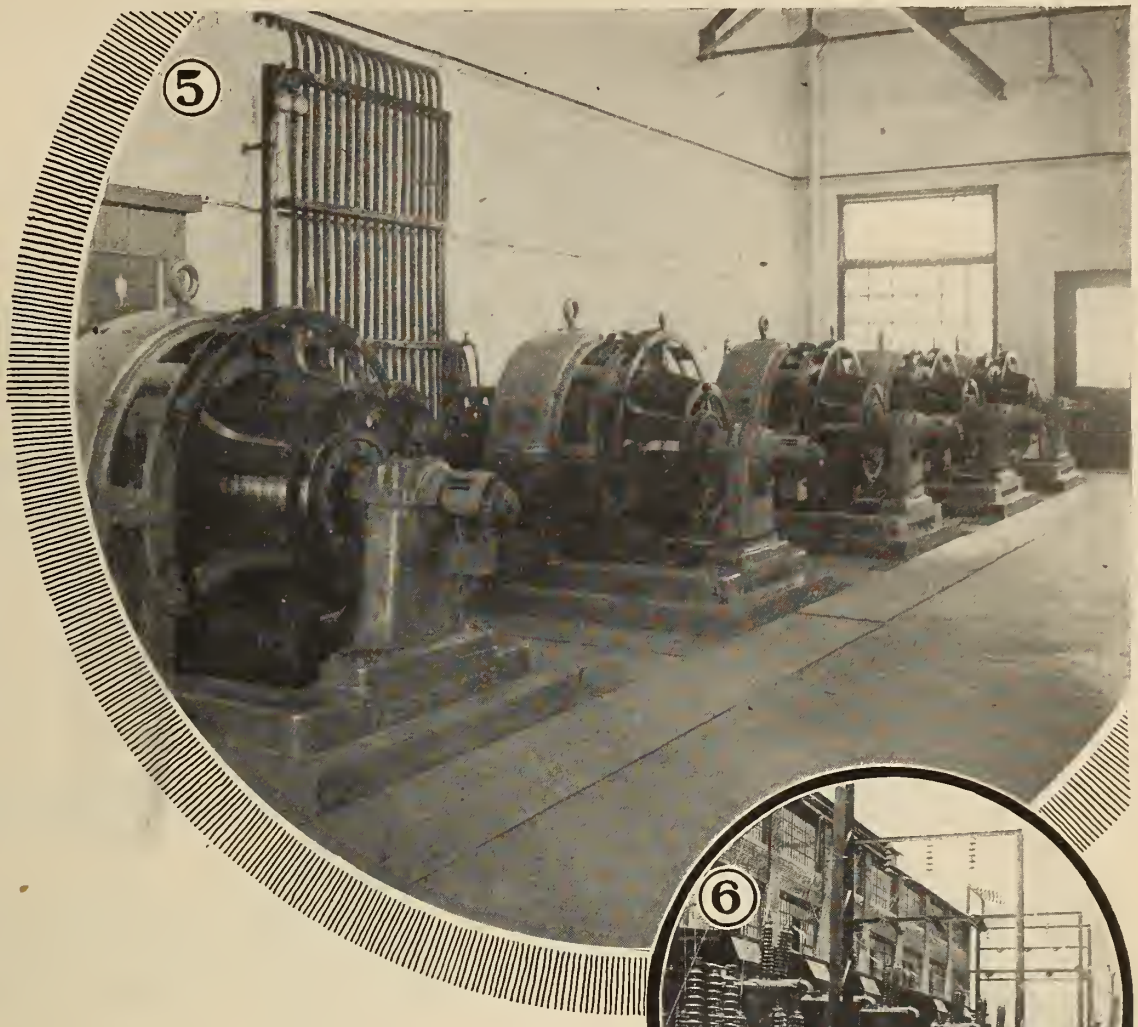

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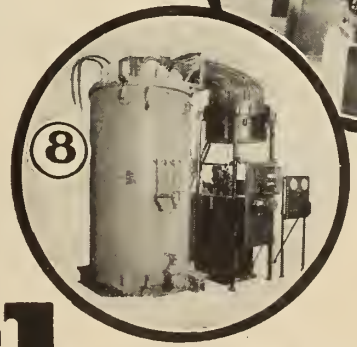

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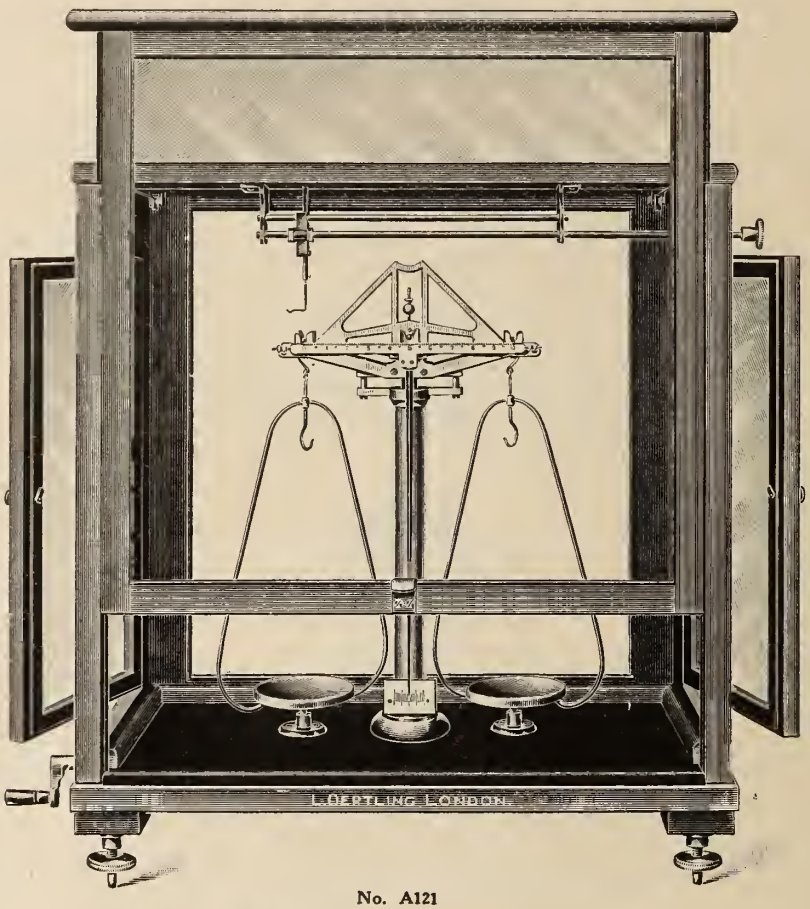

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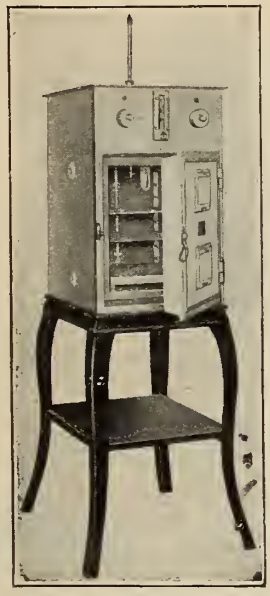

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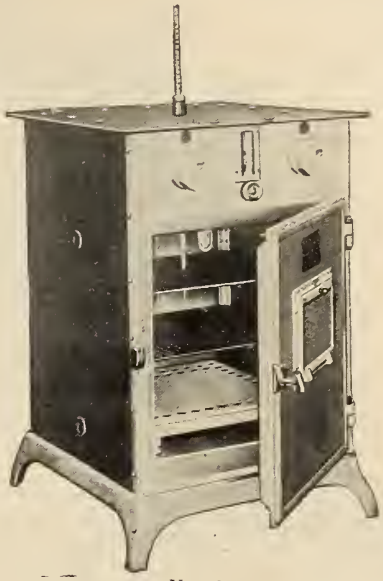

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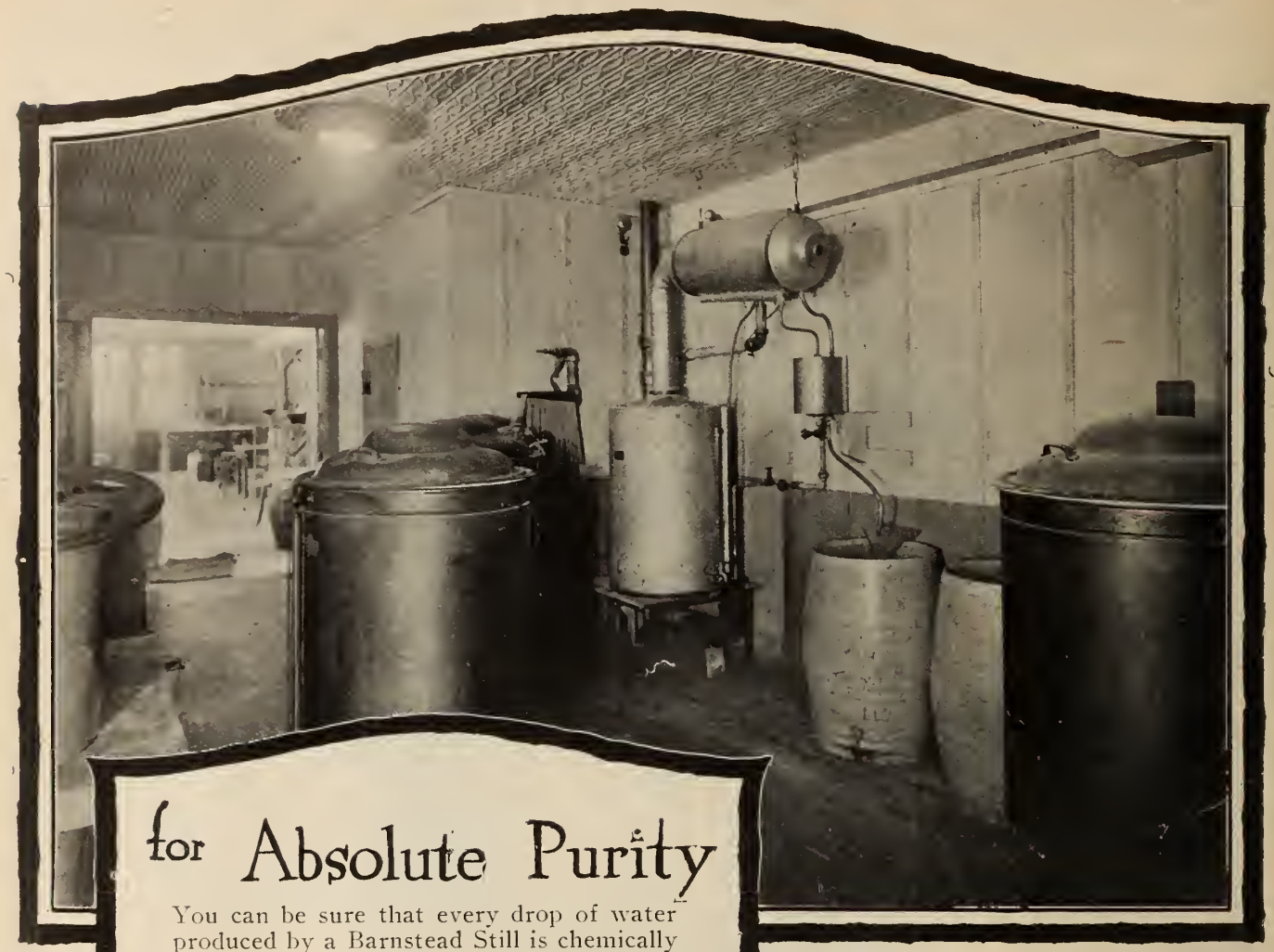

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We are pleased to be able to announce to the readers of this Journal and to all users of scientific apparatus and instruments in general, that we have recently secured the services of

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One of Our Specialties to be Exhibited at the Convention and of which

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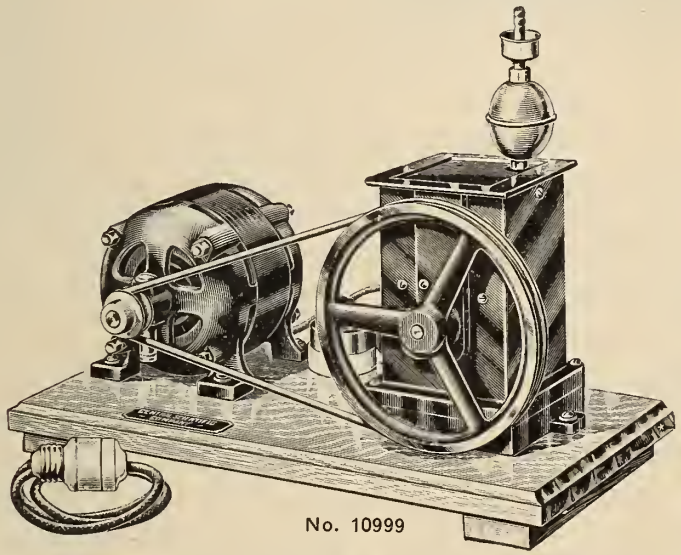

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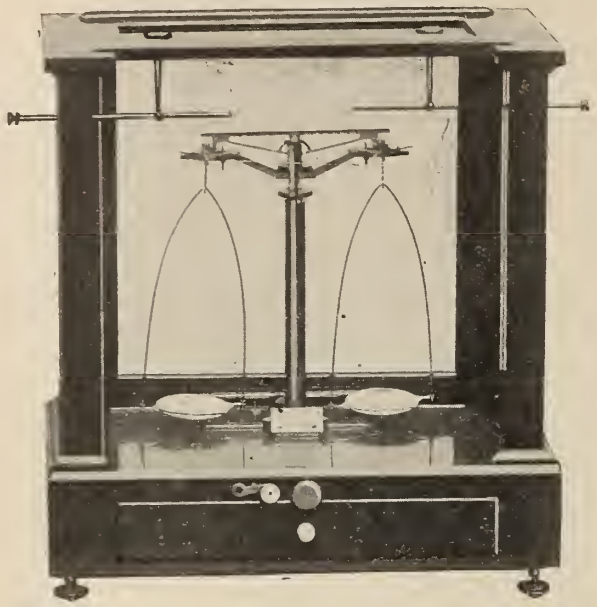

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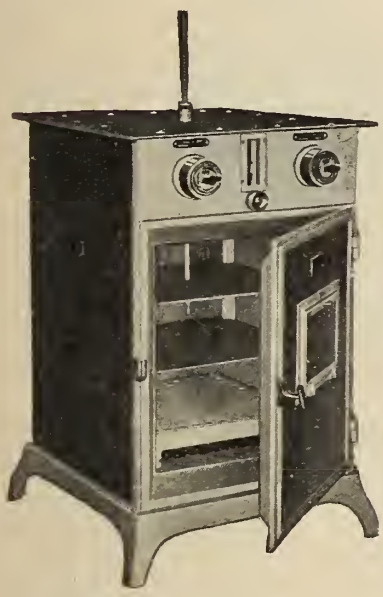

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In the selection of laboratory apparatus, the principal points to be considered are: Is the apparatus capable of performing the tests with the degree of precision desired? Will the instrument be an asset to the laboratory, from the points of view of adaptability to various uses, and life?

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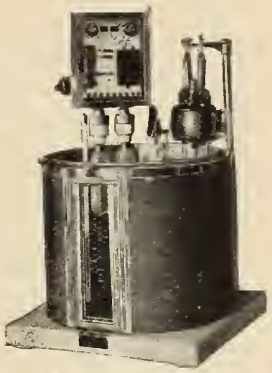
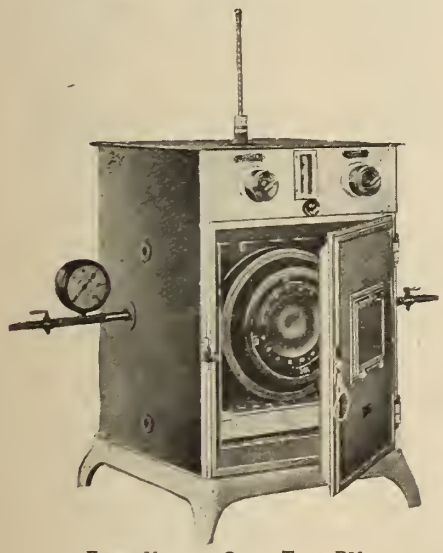


Small Sensitive Thermostat



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ONTARIO'S MINERALS

PROVINCE OF ONTARIO
DEPARTMENT OF MINES

Hon. H. Mills, Minister. *Thos. W. Gibson, Deputy Minister.*

Preliminary Summary of Mineral Statistics

(Quantities represent shipments. Tons throughout are short tons of 2,000 pounds)

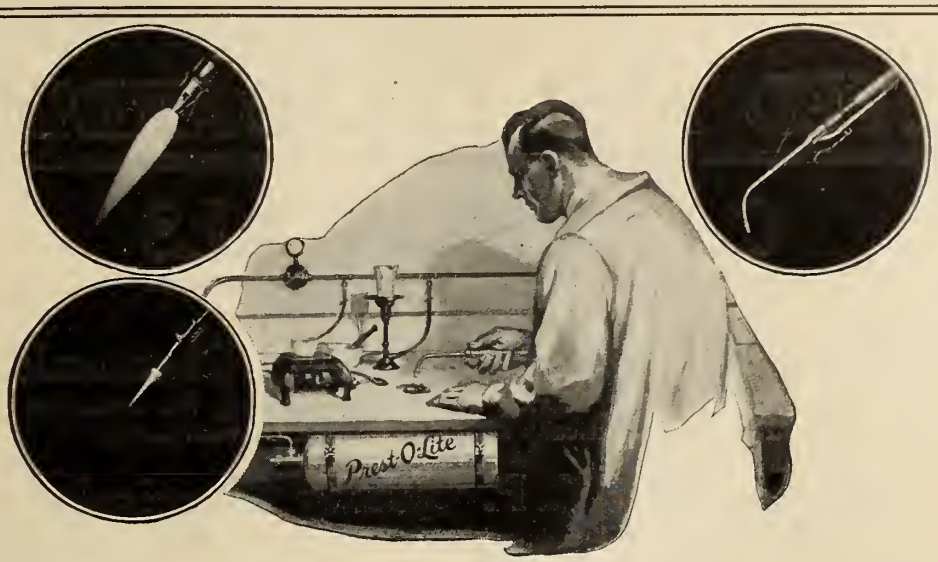
Product		1921 Quantity	1921 Value	1922 Quantity	1922 Value
METALLIC					
Gold	ounces	709,509	$14,624,085	$1,000,199	$20,674,109
Silver	"	8,412,039	5,497,160	9,167,846	6,491,271
Platinum metals (a)	"	915	51,060	642	38,884
Copper	lbs.	3,070,719	356,708	4,503,358	515,093
Nickel, metallic	"	5,430,147	1,825,359	11,175,326	3,171,434
Nickel, oxide	"	1,402,019	285,391	2,399,887	391,119
Cobalt, metallic	"	32,718	98,228	109,067	282,602
Cobalt, oxide	"	155,554	354,418	398,697	798,271
Other nickel and cobalt compounds and residues	"	108,814	114,069	1,070,935	255,034
Copper in matte exported (b)	tons	3,686	737,142	7,774	1,554,731
Nickel in matte exported (b)	"	4,850	1,939,851	8,689	3,475,649
Iron and briquettes (c)	"	100	459	4,304	25,261
Iron, pig (d)	"	82,838	2,079,729	14,052	340,730
Lead, pig	lbs.	3,570,222	190,843	2,895,695	173,742
Zinc (e)	"	.....	.....	100,283	2,181
Total metallic		.....	$27,574,202	.....	38,190,711
NON-METALLIC					
Actinolite	tons	78	$ 975	$ 50	$ 345
Apatite (Phosphate of Lime)	lbs.	.....	.....	31	248
Arsenic, white	"	2,982,525	233,763	4,118,695	299,940
Arsenate of Iron	"	.....	.....	75,000	938
Corundum	tons	402	50,250	.....	.....
Feldspar, crude and ground	"	15,506	114,059	15,515	94,985
Fluorspar	"	115	1,744	284	3,905
Graphite, crude and refined	"	363	23,273	626	34,124
Gypsum, crushed, ground and calcined	"	84,765	433,053	110,227	621,668
Iron Pyrites	"	19,375	91,604	11,235	39,763
Mica	"	222	29,630	2,229	56,480
Mineral water	Imp. gals.	.....	9,000	31,970	6,118
Natural gas	M. cu. ft.	8,590,000	2,953,000	7,919,390	3,902,800
Peat	tons	500	2,000	3,000	14,500
Petroleum	bbls.	172,859	466,716	164,732	439,286
Quartz and silica brick	tons	12,957	74,635	82,882	149,302
Salt	"	149,599	1,509,287	161,551	1,537,512
Talc., crude and ground	"	9,967	140,390	12,874	178,397
Construction Materials—($11,527,529)—					
Cement, Portland	bbls.	2,723,072	6,425,266	3,104,386	6,235,370
Lime	tons	91,355	1,172,680	116,769	1,315,479
Sand and gravel	cu. yds.	1,412,956	668,098	2,132,875	1,001,088
Sand-Lime brick	M.	.....	456,700	48,924	770,597
Stone, building, trap, granite		.....	1,812,863	.....	2,205,025
Clay Products—($5,103,618)					
Brick, common	M.	99,463	1,743,094	105,536	1,803,349
Brick, pressed	"	31,481	673,087	44,892	900,111
Brick, tapestry or rug	"			22,453	514,666
Tile, drain	"	9,910	250,040	10,110	260,312
Tile, building and floor		.....	211,529	.....	562,566
Pottery		.....	67,985	.....	88,889
Sewer pipe		.....	939,464	.....	973,824
Total non-metallic		.....	20,554,185	.....	24,011,458
Add metallic		.....	27,574,202	.....	38,190,711
Grand Total		.....	$48,128,387	.....	$62,202,169

(a) Recoveries from Canadian and United States refineries. (b) Copper and nickel exports in the form of matte were valued, respectively, at 10 and 20 cents per pound. (c) Exports and shipments to points other than Ontario blast furnaces. (d) Proportional product from Ontario ore smelted. (e) Recovery from concentrates shipped in 1919 and not previously reported.

Dividends and Bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies, or a total of $114,334,884.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

For illustrated reports, geological maps, mining laws, and list of publications, apply to Thomas W. Gibson, Deputy Minister of Mines, Parliament Buildings, Toronto, Ont.



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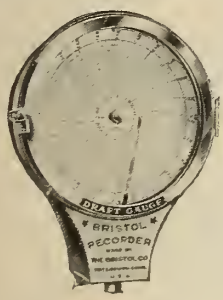

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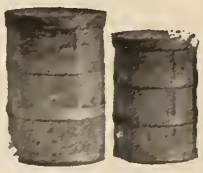

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EDITORIALS

CANADIAN CHEMISTS' CONVENTION

MAY 29th, 30th and 31st are not so far off that arrangements for Canadian chemists getting to Toronto at that time can be safely deferred. Every enlightened manufacturer, who is broad-minded and fortunate enough to have a chemist or chemists in his employ, should make it possible for him, or her, or them to be present on that occasion, and provide the means for participation in all the gatherings, social or professional, that may there be held. In so doing, he is not performing any act of charity; he is engaging in a good piece of business common-sense; and, if things get out of line in their absence, he will realize something of their worth.

The more representative these meetings become, the more their potential value to industry, sanitation and conservation is enhanced.

The Canadian Chemists' Convention is one of the ganglia of the Canadian nervous system.

SCIENCE IN INDUSTRY AND RESEARCH

PROMINENT members of the Canadian Manufacturers' Association met recently with representatives of the Government, our universities and industries, to discuss scientific and industrial research. Canadian manufacturers have been presented with proceedings in detail, and the gathering had a very considerable influence on a most important section of opinion.

From the standpoint of the average professional scientist, it is apparent that, between the theory and the practice, there is a vast difference. Research has come to mean various things to various people. A street railway may count the number of people taking a car at a certain corner during the day; or a store may relate the number of customers to the weather; and it is all called research. For this reason, many manufacturers seem to retain the idea that scientific and industrial research does not extend beyond the limits of using good judgment in developing resources and setting up a measure of control of and investigation into the operations of plants. It may even refer to a transplanting process.

There is no hard and fast line; and, if research workers, who mean quite a different thing by the word "research," are content to let the public degrade it just a little, they may find more support and funds for "pure research," or whatever the new name developed for the older, restricted idea may be.

What really should throw a jolt into any Government, and what has not been properly considered, is the fact that every other country in the world, worth naming in the matter, is getting action by some method. We have a great debt and burden; we have every urge that would startle any Government; and yet it is very rare to hear a voice on the floor of the House from any party that utters a warning against our inertia. The country has managed to drag along somehow, in spite of the lack of Government intelligence or leadership in such matters and we presume it will continue to do so.

One good solution, in our opinion, would be more co-operation within the industries, without Government guidance or support. The Manufacturers' Association is well organized and could easily start a Research Institute of its own, if desired. Agricultural groups could, within limits, aid themselves. Even the people who grow foxes could pay the man who does the research on how to feed them. We are quite sure that there is enough money in the coal business, or has been lately, to finance a couple of plants designed to play around with western lignite.

These ideas, of course, are apparently shocking; but we wonder if they should really seem so to a people gasping for prosperity.

Let us no longer argue around the feast, but sit down together, each fellow going at what is straight ahead of him. Superguidance in Canada has meant political nonsense and superinertia.

IMMIGRATION

IMMIGRATION may not, at first sight, be a live subject for professional specialists; and yet, as citizens, they are very much concerned with it. Our own particular solution would be to let almost anyone, properly equipped both mentally and physically, take a chance on making a living in any part of Canada they might choose; but the living should not be unduly guaranteed. This should be a free country to come to, if you like it, and leave it, rather than abuse it, if you do not happen to find your million under the first few grass roots you pull up. We have no quarrel with selective absorption, and we approve most heartily of advertising our national assets.

Those who, through their pioneering, have made Canada what it is, demonstrated, quite clearly, how the country can be developed, and there is no royal road to colonization. Restrictions in the movement of population have been, as history clearly records, a most prolific source of trouble and wars. A system or a civilization, not capable

of making a true, national solution, seems to remain in a dangerous state of unstable equilibrium.

Magnitude in business and commerce does not come about by restrictions guarding the number of workers—their religion, their language, or even their color. From a purely scientific standpoint, forces mental and forces physical eventually count, and are better handled at low voltages than stepped up to more dangerous charges.

It is often pointed out that Canada has lost thousands of her finest young men and women to the United States. This is true; but Canada has also gained American citizens in large numbers. Perhaps over a period of fifty or sixty years, we have lost more than we have gained. Such cities as Detroit and Buffalo have gathered large harvests from Canadian farms and towns. New England has used French-Canadian labor in particular, while Chicago and New York have drawn Canadians, just as they have grown at the expense of smaller American centres. American industries have gained engineers and chemists of outstanding rank, from Canadian universities. We are proud to feel that Canadians have done so well in the United States.

The question is: Have we really lost? In the meantime, we have all prospered in a reasonable manner. Per capita, Canadians are not poor; in fact, they rank very high in the world's possessions. What we have made in reality is an investment, which, without doubt, will return to us many times. It is inconceivable to believe that, in the future (and not so far away either), we shall not have returned to us, in United States capital and manhood, perhaps many times what we loaned. Canadian opportunities, in most ways, are strikingly appealing to the adventurous spirit. Canada stands to-day in the unique position of a vast territory, where a type of people can be developed that will combine the best in Government and Nationality that had been worked out in Great Britain and the United States during the last one hundred and fifty years. The leading strain in Canadians eventually will probably be a natural cross between Canadianized Americans and Canadianized Great Britishers. Surely this can be counted upon to add something of value to the progress of the human race. If a weld is made properly, it should be stronger than it ever was before the break.

WHO SHOULD DIRECT?

ON the Financial Page of the Rochester "Times-Union," of April 3rd, appeared a face familiar to the chemists of Canada, recalling some pleasant meetings and a delightful personality. It was the face of Dr. C. E. K. Mees, and it was featured there as a result of his being elected to the Board of Directors of the Eastman Kodak Company. Dr. Mees, of course, is one of those combinations, a first-rank scientist and a good business man. We were going to say "unusual combinations," until we put in the words "first-rank scientist," when it occurred to us that most first-rank scientists are good business men. They have the breadth of vision and insight into problems that constitute the essentials of real business ability.

This being the case, and business management being under indictment by Hoover's engineering jury as responsible for the greater part of waste in industry, why do we not see a change in the policy of electing directors in our great mercantile bodies?

We have touched on this before; but it will stand much reiteration.

A firm's Board of Directors should be nearer a cross-section of the varied experiences required to operate it. The custom has been to make it rather a board of trustees, which has, in the great majority of cases, merely rubber-stamped the suggestions of the management.

If our directors knew personally technical and labor problems, as well as the balance-sheet, we would have made one large step in progress. We congratulate the Eastman Company on its action.

STANDARDS AND DEFINITIONS

THOSE who have been reading the "Journal of the Society of Chemical Industry," and are interested in verbal tilts, have been regaled with a delightful passage-at-arms between a well-known chemist and a well-known lawyer, as to the status of calcium carbide.

We are not going to enter this conflict, which, we understand, has lapsed. It is a fair illustration, however, of the trouble that may arise from absolute definitions in a world of imitation in the first place, and, in the second place, from putting into the hands of one profession the power of petrifying the phraseology of another.

The scientist has always been the advocate of fact, rather than dogma.

For certain purposes, such as prosecution under laws affecting adulteration, it has been found necessary, (or, rather, advisable), to prescribe methods of analysis or details of procedure in reaching conclusions. As a result, we have standard methods of analysis, standard methods of sampling, and our legal friends now want to standardize our phraseology for us.

These things are bred of distrust, and, in some measure, are not a credit to the profession. We have known, and probably others have too, cases wherein results contrary to the facts have followed blind adherence to a standard method, to the considerable loss of parties to a controversy.

We believe there is a far too loose use of the word "standard." In many cases "approved practice" would come nearer the mark. We need standard men, rather than standard practice. We must get away from the letter that killeth, to the spirit that maketh alive.

Standardization must be used as a convenience and not a sarcophagus. The best referee for a hockey-match is a hockey-player; and the best referee on chemical matters is the chemist.

The wholesale application of hard and fast standards leads to the perpetuation of mediocrity. It is the kind of thing that makes the analyst a journeyman, and brings upon many a good man the damnation of being classified as a routine chemist. One of the greatest factors in industrial research is the accurate and responsible recording of routine; but the chemist has allowed himself to be jockeyed into the position of having the value of his services appraised by interests that have no conception of that value. Even our friends, the engineers, who bewail their sad fate in the matter of remuneration, have been better advertisers. You never hear of routine engineers, routine lawyers, or routine doctors—just routine chemists. That's what misdirected standardization produces.

HUNT THE THIMBLE

ONE of the old Christmas party games is "Hunt the Thimble." The idea was that while the remainder of the party was out of the room, one of them undertook to place a thimble in such a position that, while it must be visible in any part of the room, it would require some search to find it. The searchers might be looking right at it, at times, without noticing it.

From what we have been able to read of the new element, Hafnium, it must have been in a somewhat analogous position, when, as its discoverers state "in all commercial 'pure' zirconium preparations, the presence of at least 1% of the new element could be revealed," and when it is said to constitute 0.002% of the earth's crust. If carbon is correctly given as 0.2%, the abundance of Hafnium can be seen in the statement that one pound of Hafnium exists for every hundred pounds of, say, anthracite coal, coke or charcoal.

The reference of Dr. Scott to the New Zealand iron sands has great suggestive value for Canadian mineralogists, (as pointed out by Dr. MacIntyre), in the Moisie sands, that maelstrom for optimistic inventors, down on the North Shore of the Gulf of St. Lawrence, and in other titaniferous bodies. Might it not be possible that some of the metallurgical difficulties in such material would be removed by determining the presence of Hafnium and treating accordingly, or by finding some other "thimble," tantalizingly obvious when discovered?

PROF. W. LASH MILLER HONORED.

A distinct honor was conferred upon Canada and Professor Miller, when he was invited to represent his country and Canadian Chemistry at the opening of the new Chemical Laboratory at Yale University. Some seven chemists from foreign countries were invited. These scientists are co-operating in the production of a special volume of papers, commemorating the event. Dr. Miller is contributing an article on "The Method of Professor Willard Gibbs in Chemical Thermo-Dynamics."

On this subject no one is better qualified to write than the head of the Department of Chemistry at the University of Toronto. Following repeated invitations, Dr. Miller is going to California this summer to deliver a special course of lectures on Physical Chemistry, at the University of California, Los Angeles, during the regular summer session.

THE PASSING OF GEORGE LUNGE.

On January 3rd, George Lunge died at the age of eighty-three. He was born at Breslau, Sept. 15, 1839. German papers are carrying extensive accounts of his work and career. At the age of nineteen he passed his doctor's examination, "Magna cum laude." It was during the next year that Bunsen and Kirckhoff opened up the field of spectrum analysis, and Lunge was one of their ablest assistants. He was early attracted to industrial work, entering the fertilizer field. For a time he operated his own factory, but in 1869 went to England to study industrial conditions. Following the refusal of Heinrich Caro (Director of the Baden Aniline and Soda Works), he accepted the important position of head of the only Technical High School then operating, namely, the Zurich Polytechnique Institute. Lunge was then thirty-seven years old. After thirty-two years' teaching he resigned, and after fifty-seven years had passed since his Doctor's degree, he published the fourth edition of his famous Handbook on the Soda Industry.

Lunge was one of the few men in the field of chemical technique who was as celebrated as an investigator and inventor as he was as a writer and professor. During his lifetime he studied chemical technical problems of more than 550 different types, leaving traces of his work in nearly every branch of industrial chemistry. His chief interest was in sulphuric acid and soda industries. He distinguished himself in technical analysis. The introduction of methyl orange is but a single effort. The work of Lunge on technical analytical methods stamps him as perhaps the foremost man in the last century.

He had a natural gift for writing and lecturing. His early education had been classical, so that he came upon science well-equipped for his special mission. His technical works have stood the test of time. His works on Coal Tar, Ammonia, Sulphuric Acid, Soda, and general inorganic chemical industries have made him a world teacher and guide. During his thirty-two years as a professor he developed a very large number of students, and through them his work and ideas have been carried to the industries of the whole world. Through his death the chemical profession has lost a noteworthy figure, and the world a really great scientist.

Negotiations between the sulphur producers of Italy and the United States have resulted in an agreement whereby competition is to be eliminated to a large extent, and the various markets of the world allocated between the two sources of supply with the ultimate effect of increasing prices gradually until they reach those prevailing in pre-war times.

The exports of sulphur from Sicily last year amounted to 133,264 tons, as against 146,886 tons in 1921. Production was 137,640 tons, as against 240,089 tons in 1921.

Denatured Alcohol in Canada---I.*

A Complete Summary of the Composition, Use and Consumption of Denatured Alcohol, With a Review of Regulations in the United States and Great Britain.

By Ross E. Gilmore.†

THE purpose of this paper is to give a general survey of the different grades of denatured alcohol authorized in Canada. An attempt is made to give the date, composition, use and consumption of the different grades and to compare the Canadian grades with those authorized in Great Britain and in the United States. The composition of the denatured alcohol and of the denaturants is given special attention mainly from the viewpoint of the chemist. The information gathered and reported here along with the comments will, it is hoped, be of value to the seeker after both general and special knowledge as to the various Canadian grades of denatured alcohol.

Denatured alcohol, according to the Canadian Inland Revenue definition, means "alcohol in suitable admixture with such denaturants as to render it in the judgment of the minister, non-potable and to prevent recovery of the ethyl alcohol." The object of denaturing is to permit, free from duty, the use of ethyl alcohol for purposes other than drinking, i.e., for use in the arts and industries and for fuel, light and power. A denatured alcohol may also be termed an industrial alcohol. It is, however, mainly that part of the total non-potable industrial alcohol which is tax free that is known as denatured alcohol. A full discussion of industrial alcohol as to its manufacture, etc., is beyond the scope of this paper, and outside of referring to special regulations for using commercially pure ethyl alcohol in bond and taxable, for certain industrial purposes, the following will deal with "denatured alcohol" rather than "industrial alcohol" in general.

Completely and Specially Denatured Grades.

The definition for "denatured alcohol" given above is to be found in Article 368, Part X., Chapter 52, Inland Revenue Act, Canada. According to the same article, "specially denatured" means "alcohol in suitable admixture with such special denaturants as have been approved by the minister." According to Article 371, "denatured alcohol is sold without restriction, while specially denatured alcohol is sold only to licensed dealers to be used in the arts and industries in cases where denatured alcohol would be unsuitable and under such conditions as the minister may by regulations prescribe," or, in other words, its sale is restricted. In the United States the terms "completely denatured," "specially denatured," and "formula" are used. The completely denatured formulæ are defined as those which have been denatured by certain fixed formulæ, for sale to the general public with very little supervision, and the specially denatured formulæ are those, not so completely denatured, and are not for sale to the general public, but can be obtained only under a heavy bond. For the purpose of this paper the word "unrestricted" will apply to either the Canadian "denatured alcohols" or the U. S. denatured alcohols, and "restricted" will apply to the specially denatured grades or formulæ.

The use of commercially pure ethyl alcohol, not denatured, is authorized in Canada to be used in bond and under varying rates of excise duties as follows:

1. For the manufacture of crude fulminate of mercury pure ethyl alcohol is allowed free. The various rules and regulations as to use in bond must, however, be strictly adhered to.

2. Hospitals and universities may obtain pure ethyl alcohol on payment of the regular excise duty ($9 per proof gallon) with the provision that 99 per cent. of the duty is refundable. Besides the undenatured industrial alcohol obtainable practically tax free in this way, there are the two restricted grades of denatured alcohol, viz., No. 1 special and No. 1 F for use in hospitals and universities.

3. Manufacturers of various chemical products may obtain ethyl alcohol or domestic spirits, as it is called, by the payment of an excise duty ranging from 15 cents to $2.43 per proof gallon.

Under the 15-cent rate the following are listed, viz.: Collodion, tooth paste, ethyl bromide, ethyl chloride, chloroform, sulphuric ether and soap.

To this list has recently been added sensitized photographic emulsions, in the manufacture of which phenol and methyl alcohol are required to be added to the ethyl alcohol before use.

Vinegar comes under the 27-cent per proof gallon excise and perfume spirits under the 75-cent rate.

Proprietary medicines, pharmaceutical prepaartions, extracts and essences are the uses listed under the $2.40 to $2.43 rates of excise.

Details as to these different rates of duty and the various regulations governing the use of ethyl alcohol in the manufacture of the drugs and other chemical products may be found in Circular No. 220 C, Department of Customs and Excise, Canada, dated October 16th, 1922.

Table I. is a list of the ten grades of denatured alcohol authorized in Canada, and gives the name of grade, composition, general use and percentage of total consumption respectively. It will be noticed that the three unrestricted sale grades, viz., No. 2 Standard, No. 2 Benzol and No. 2 Pyridine, represent, roughly, 42 per cent. of the total consumption. Their general uses are for burning and anti-freeze purposes, and for rough paint and varnish solvent work. Grade No. 1 Benzine, representing 37 per cent. of the total consumption, is a restricted sale grade, and is used mainly for varnish and shellac solvents and in the manufacture of certain drugs and chemicals where the alcohol does not stay in the final product. No. 1 Standard, for the same use as No. 1 Benzine, has an average of about 6 per cent. consumption, leaving only 15 per cent. of the total consumption for the remaining five grades of specially denatured alcohol for specially authorized uses.

Denaturants and Their Comparative Importance.

In the manufacture of denatured alcohol the denaturant must comply with the Government specifications and regulations, and then in order to be in demand commercially, it must have the properties peculiar to the use to which it is to be applied.

The requirements of the Government specifications are two-fold, viz.: The denaturant when mixed with grain alcohol should (a) render the mixture non-potable, and (b) should make the recovery of the separate ingredients,

*Paper read at the March meeting of the Ottawa Section of the Society of Chemical Industry. This paper will appear in two sections of which this is the first. Part II. will appear in our June issue.

†Chief Chemist, Fuel Testing Division, Department of Mines, Ottawa. Formerly Chief Chemist, Standard Chemical Co., Montreal.

TABLE I—DENATURED ALCOHOL AUTHORIZED IN CANADA

Grade	Composition	General (Approved) Uses	Conditions of Sale	% of Total Consumption (1922)
No. 2 Standard	70 parts Ethyl Alcohol 30 parts Methyl Hydrate. (Not more than 50% Hydrate)	Burning and antifreeze; paint and varnish industry	Unrestricted	7
No. 2 Benzol	100 parts Ethyl Alcohol 2.5 parts Benzol 0.5 parts Nitro Benzol 0.2 parts Pine Oil	Burning and antifreeze; paint and varnish industry	Unrestricted	5
No. 2 Pyridine	100 parts Ethyl Alcohol 2 parts Methyl Hydrate 1 part Pyridine Bases	Burning and antifreeze; paint and varnish industry	Unrestricted	30
No. 1 Benzine	90 parts Ethyl Alcohol 9 parts Methyl Hydrate. 1 part Benzine (Kerosene)	Manufacture of paint, varnish and shellac	Restricted	37
No. 1 Standard	80 parts Ethyl Alcohol 20 parts Methyl Hydrate (Not more than 25% Hydrate)	Same as for No. 1 Benzine	Restricted	6
No. 1 Special	90 parts Ethyl Alcohol 10 parts Methyl Hydrate	Hospitals only	Restricted	1
No. 1D (Iodine)	100 parts Ethyl Alcohol 2.5 parts Iodine 1.5 parts Potassium Iodide	Tincture of Iodine B. P.	Restricted	9
No. 1A	100 gallons Ethyl Alcohol 65 lbs. Sulphuric Ether 3 lbs. Cadmium Iodide 3 lbs. Ammonium Iodide	Collodion; photographic prints, engravings, enlargements, etc.	Restricted	¼
No. 1 C	100 gallons Ethyl Alcohol 5 gallons 40% Nicotine Solution. (Plus yellow and blue dyes)	Deodorant solutions for cigars, cigarettes, smoking and chewing tobacco	Restricted	¾
No. 1 F	1 gallon Ethyl Alcohol 2.5% Diethylphthalate 5 grains Brucine Sulphate	Rubbing alcohol compound	Restricted	4

especially the ethyl alcohol, as difficult as possible. "Every person who attempts to reclaim the ethyl alcohol or other ingredients of a denatured alcohol is guilty of an indictable offence, and shall be liable to a heavy penalty." From the health standpoint it would seem a good denaturant is one which when taken internally either purposely or accidently would give warning by causing sickness, but not one which would cause death. The relation of toxicity of the denaturant to the non-potability is an important topic, which will be referred to later.

The general industrial requirements of a denatured alcohol are that it be miscible with 95 per cent. grain alcohol, and must have the same general solvent properties of the ethyl alcohol product to which it is added. Special requirements of good denaturants are that they be miscible in practically all proportions with water.

The original and most commonly used denaturant is wood alcohol, of which methyl alcohol is the main ingredient. The term "wood alcohol" is, however, not allowed in commerce. In Canada the official nomenclature is "methyl hydrate," and in the United States "methanol"! As a denaturant the term wood alcohol is more to the point rather than the term methyl alcohol, as "wood alcohol" in the industry is an impure product and "pure methyl alcohol" is a highly refined grade. According to the specifications laid down "methylating spirits," as the denaturant grade of methyl hydrate is called, must contain certain impurities which serve to give the grain alcohol to which it is added a disagreeable odor and other non-potable characters. These impurities are certain ketone and higher alcohols which are necessarily left in the methyl hydrate in order that it may conform to the acetone content specification on the one hand, and to the bromine absorption specification on the other. The methyl hydrate used for methylating purposes is known by the trade as "Government grade," and is different from the other grades of methyl hydrate. Among the several different grades of methyl hydrate refined from the "crude wood alcohol," the Government grade is the poorest. Columbian spirits and pure methyl are, on the other hand, the best, and while their use is permitted in the specially denatured alcohol in the United States, their use is not allowed in the ordinary completely denatured alcohol grades.

Owing to its importance as a denaturant for grain alcohol, both in the past and present, the question of wood alcohol or "methylating spirits" deserves special attention. Its merits appear to more than balance its more or less objectional characteristics, and it should be pointed out that most of its objectional properties are there because the denaturing laws and specifications demand that the general disagreeable characteristics be present in order to make it an effective denaturant.

The Canadian Government specifications for methyl hydrate (wood alcohol) used for denaturing purposes may be summed up as follows:

Specific Gravity at 60° F.—not less than 0.815, i.e., not weaker than 95.2 per cent. vol. (Thorpe's tables), which is equivalent to approximately 67 O. P. (over proof).

Color—Colorless, to pale straw color.

Volatility—Must be completely volatile on a steam bath at 100° C.

Miscibility—Must give a clear or only faintly opalescent solution on diluting with twice its volume of water.

Acetone Content—Not less than 5 grms. and not more than 15 grms. per 100 c.c.

Bromine Absorption—It must contain a sufficient quantity of (pyroligneous and allied) impurities so that not more than 25 c.c. or less than 15 c.c. shall be required to decolorize a standard solution containing 0.5 grams of bromine.

Other Requirements—It shall be of such a character as to render ethyl alcohol when diluted with water unfit for use as a beverage when methyl hydrate is present in the proportion of one part of ten parts of ethyl alcohol.

Comments on Wood Alcohol Specifications.

The bromine absorption specification may be considered the most important, in that it is meant to be a guarantee that the alcohol used contains sufficient impurities derived from wood to render the ethyl alcohol with which it is mixed unfit for use as a beverage. The bromine number is an indication of the purity or refinement of the methyl hydrate used. The higher the bromine number the purer the grade, and vice-versa, the lower the bromine number the greater the impurity of the wood alcohol product. A pure grade of refined methyl hydrate, e.g., columbian spirits, ranges over 1,000 in bromine number, while the most impure grades have bromine numbers as low as 3 to 5. It will therefore be seen that a methyl hydrate with a bromine number ranging between 15 to 25 cannot be considered other than a poor, impure grade. The impurities present to give this low bromine number range are mostly unsaturated ketones other than acetone, unsaturated alcohols with boiling point ranges above that of methyl alcohol—along with varying amounts, usually small, of aldehydes and amines.

The bromine absorption specification is effective in that it gives the alcohol mixture an objectional odor and thus helps to render the resultant denatured alcohol offensive for drinking, or, in other words, is effective in rendering it non-potable. The impurities necessary, according to the bromine number specifications, also make the resultant methylated spirits less valuable as a solvent for certain specific purposes, and, of course, the larger percentage of wood alcohol present the more objectional it is in this respect and vice-versa. But to do away with or even to raise the bromine number specifications more than slightly would be defeating the original and still valid purposes of using wood alcohol as a denaturant.

Denaturants Other Than Methyl Hydrate.

In denatured alcohol grades where the percentage of wood alcohol is allowed to be low, other denaturants such as pyridine bases and benzine (kerosene) are present. In Canada these two are the only ingredients used with methyl hydrate.

Benzine as used as a denaturant in Grade No. 1 Benzine is derived from petroleum. It must be of such a character as to impart a decided odor to ethyl alcohol when mixed in proportion of one-half of 1 per cent. by volume. The merits of benzine as a denaturant seem to be restricted by its property of giving the grain alcohol to which it is mixed an offensive odor and taste. Although the denatured alcohol grade using benzine finds extensive use as a solvent, the presence of benzine makes the grade unsatisfactory as a solvent in the manufacture of certain soaps and other chemicals. When present in a denatured alcohol in conjunction with wood alcohol it helps to render the ethyl alcohol difficult of refinement in the pure state, which is one of the main purposes of a denaturant.

Pyridine bases as used as a denaturant in grade No. 2 Pyridine must meet certain specifications such as color, reaction with cadmium chloride, behaviour with Nessler's reagent, boiling point, miscibility with water, content of water, and alkalinity. The presence of the pyridine bases is quite effective in giving the ethyl alcohol to which it is added a disagreeable odor. A denatured alcohol using pyridine bases should find more general use as a solvent, but for certain purposes it is like the grades using benzine quite unsuitable. The alkaline nature of the pyridine bases which can be neutralized by acids to form their salts along with the high boiling points—50 per cent distillable at 140° C. and 90 per cent. at 160° C—are not in its favor in respect to rendering difficult for recovery of ethyl alcohol. When added in conjunction with wood alcohol, however, this defect is somewhat remedied.

Among the denaturants used not in conjunction with wood alcohol are benzol, pine oil and nitrobenzol. These three ingredients are used together in what is known as denatured alcohol, grade No. 2 Benzol.

Benzol as used as a partial denaturant is a coal tar product and is subject to certain specifications in respect to insolubility in water and boiling point range. The pine oil and nitrobenzol used in conjunction with benzol as denaturants must meet specifications mainly in respect to specific gravity. The purpose of these latter two substances is apparently to mask the odor of and to impart a burning taste to the completely denatured alcohol. In this respect the combination of these three ingredients is to be considered an effective denaturant mixture. The grade of denatured alcohol using benzol is used principally for burning and anti-freeze purposes, and although it is used to a certain extent as a solvent, its use for this latter purpose seems to be limited.

The denaturants hitherto discussed are used in the "denatured alcohols" for unrestricted sale. For the specially denatured grades it will be noticed in Table I. special denaturants are allowed. The list of these authorized in Canada is as follows: Iodine, potassium, iodide, ether, cadmium chloride, ammonium iodide, nicotine compounds, brucine sulphate and diethylphthalate. Practically all these special denaturants, while they are effective in making their respective denatured alcohol grades poisonous, they are not nearly as effective in respect to imparting an offensive odor to the ethyl alcohol as are the several denaturants discussed above. As to the difficulty of recovering the individual denaturants and ethyl alcohol components, practically all of these special denaturants are open to the criticism that they are more or less easy to recover; which defect is, however, somewhat remedied by the regulations insuring that their sale and use are under permit and heavy bond.

GOVERNMENT POSITIONS OPEN.

Male Junior Chemist—Mines Branch, Department of Mines, Ottawa. Initial salary, $1,680 per annum, increasing for efficient service at rate of $120 per annum until maximum of $2,040 has been reached. Duties—Chemical analysis under direction. Qualifications—Education equivalent to graduation from a university of recognized standing with specialization in chemistry, preferably experience in analysis of waters, brines and alkali salts. Application forms properly filled in must be filed with the Civil Service Commission, Ottawa, not later than May 25th. Forms may be obatined from any office of the Employment Service of Canada, or from the Civil Service Commission.

Engineer, Mines Branch, Department of Mines, Ottawa; Division of Ceramics and Road Materials. Initial salary, $2,100 per annum, increasing at rate of $120 per annum until a maximum of $2,580 has been reached. Duties—Under direction to make field investigations on clay deposits; to study brick manufacturing methods in Canadian plants with a view of improving methods; to conduct experiments with a view to developing means of utilizing Canadian raw materials in the ceramic industries, etc. Qualifications—Graduation in Ceramic Engineering from a recognized technical college; at least three years' experience in commercial or research work since graduation; a good working knowledge of ceramic chemistry and physics. Application forms properly filled in must be filed with the Civil Service Commission, Ottawa, not later than May 21st.

Mining and Metallurgical Progress in Canada

A Review of the Present Situation and Proposals for Future Developments

By STOPFORD BRUNTON
(Mining Geologist, Montreal.)

THE following is a brief summary of the mining situation in Canada during 1922, with some of the proposals now being put forward for future development. For the sake of clearness the various provinces are dealt with separately.

Nova Scotia—With regard to the fuel situation, which is occupying the attention of the people of Canada at the present time, it may be of interest to note that Nova Scotia produced about 5,959,000 tons of coal, valued at $27,654,000, in 1922, and is one of Canada's fuel-producing provinces. The whole output was, however, badly hampered by strikes, the total loss in Canada due to these causes being 1,222,288 working days, but it is to be hoped that conditions during the coming year will be much improved. The British Empire Steel Corporation has issued a statement that the matter of establishing a coking plant in Montreal is being investigated so that Nova Scotia coal may be available for points furtehr west than at present.

A revival of the gold industry was generally apparent throughout this province in 1922, some 20 mines being in operation on a small scale; and this increased activity has been fully maintained, in fact in practically all the well-known mining districts additional vigor is being thrown into prospecting and deevlopment work. In the majority of instances these properties have been favorably reported on by engineers, and with the close and more intelligent study which is already being given to better methods of extraction, and with the modern machinery and a more economical system of mining much improved results will soon become apparent.

Salt is being mined at Malagash, where a mine was opened about 1920, and has now been developed to a depth of 200 feet. The salt is found to be better and more uniform in quality as increased depth is reached, and while the present output is 40 tons per day, it is hoped that this will be increased in the near future.

Quarries are being worked for gypsum, plaster, lime, barytes, granite and sandstone, of which gypsum only is being mined on any considerable scale, 235,870 tons being produced out of a total for Canada of 492,164.

New Brunswick—Bituminous coal to the extent of 297,-452 tons, valued at $1,251,975, was obtained and shipments were made of 287,208 tons. Petroleum gave 7,778 barrels, value $32,732. Apart from these there is very little mining in the province.

Quebec—In 1922 the asbestos sold and shipped by the Quebec mines was 176,340 tons, valued at $6,058,171, as compared with 84,475 tons, valued at $5,199,789, for 1921. The Asbestos Corporation of the Thetford district plans to enlarge its operations, including an additional mill of 1,200 tons daily capacity.

A water-power development is to be installed on the Quinze river to provide power for the Porcupine and Kirkland lake fields. This power will also be available for any development in the north-western area of Quebec, where the Quebec Government has undertaken the construction of several roads for the assistance of people interested in the gold prospects in the township of Rouyn and those adjoining it.

Feldspar mining has been increasing in the last two years, and has received an impetus by the discovery of a large body of cream white orthoclase in Derry Township in the fall of 1920. From this deposit 10,000 tons of high-grade potash feldspar was shipped in 1921, last year's production being slightly lower.

Mica, magnesite, china clay, and natural iron oxide are showing signs of a renewal of activity after having suffered greatly during the two preceding years; in all of them slight improvements have taken place.

Ontario—Ontario produced 999,848 oz of gold, or 81.22 per cent. of Canada's total, with an increase over last year of 291,635 oz., or 41.2 per cent. Producing mines were Hollinger, Dome, McIntyre, in the Porcupine area; and Wright-Hargreaves, Teck-Hughes, Lake Shore, Kirkland Lake Gold, Kirkland Proprietary, and Montreal Ontario, in the Kirkland Lake field. The mines in the latter area were forced to close down for a few weeks last fall as a result of the disastrous forest fire which destroyed the power line. The present production is impeded by lack of power, but this defect should be remedied by the new development mentioned above. The Crown Reserve is continuing development work at the 550-ft. level of its shaft at Lared Lake, and underground work continues to confirm previous reports regarding widths and assays. The directors of the Wright-Hargreaves mine have announced that the capacity of the mill will be doubled, which will bring the output to 400-500 tons daily. Work on the lower levels seems to justify this increase, and the shaft is approaching the 1,000-ft. level. The Teck-Hughes shaft will be down to the 1,100-ft. level in April, the January production of this mine was $89,294, and that for the first two weeks in February $53,000.

Silver produced was 10,698,522 fine oz., value $7,223,749, as against 9,761,607 fine oz. in 1921, value $6,116,037. The Keely mine shows remarkable improvement recently; the mill is being enlarged, and a good deal of additional surface construction is being undertaken; January production amounted to 115,000 oz., and February production to 153,-000 oz. The Frontier Mine is reported as doing very well also. During the month of March it produced 184,817 oz., which puts it among the largest silver producers in Canada.

Copper only reached 10,888,882 lbs., value $1,457,150, in 1922, principally from the copper nickel ores of the Sudbury district. During last year the plants of the British-American Nickel Company were closed down owing to the poor market. The Mond Nickel Company operated at a reduced rate for the greater part of the year, while the International Nickel Company did not operate till September, when three furnaces were blown in. All the nickel mines are showing increased activity, and it is announced that the British America Nickel Corporation will resume work immediately, about 700 men being employed at the mines and smelter at Sudbury, and about 300 at the refinery near Ottawa.

Feldspar was mined and shipped to the extent of 15,895 tons from Ontario in 1922; and the grinding plants at Kingston and Toronto, owned by the Frontenac Floor and Wall Tile Company and the Feldspar Milling Company respectively, were both operated. Also 198 tons of fluorite ore were mined during the year in the Madoc District.

Ontario's petroleum was 164,731 barrels out of a total for Canada of 178,567. The average price per barrel (less bounty) during the first six months was $2.88 and for the whole year $2.67.

Manitoba—The Gold Pan mine has been worked with a view to actual production from the ore body. The old mill was burned last summer, and the operation of the mill was delayed by this accident.

Granite is being mined by Brookville Quarries, Ltd., on their property on the Greater Winnipeg Water District Railway. Colors range from red to pinkish grey and black, and it is claimed that the quality is as good as that of any granite placed on the Winnipeg market.

Manitoba produced about $3,225 in gold, but did not produce any copper. The Mandy mine shipped 7,535 tons of copper ore to Trail in 1920, but difficulty of transportation, high freight rates, and greatly curtailed market rendered the economic production of copper impossible for a time.

Saskatchewan—Lignite was produced in this province 302,312 short tons, with a value of $625,483 being obtained, mostly from the Bienfait Estevan Roche Percee area. The new mine, operated by the Lignite Coal Mines, Ltd., is now shipping coal. Development work has been going on at the mine for nearly a year, and the company is now in a position to supply a large quantity of coal.

The Province of Saskatchewan excels in the quality and quantity of that class of raw refractories known as fireclays; and in addition to this valuable material possesses other argillaceous deposits, from which can be manufactured practically the whole range of structural clay products; a fact of vital importance to a region almost entirely devoid of native timber and building stone. The development of such clays and clay products should be of especial interest to chemists.

Alberta—In 1922 Alberta produced 40,417 short tons of anthracite, value $137,821; 2,817,985 short tons of bituminous coal, value $11,793,267; and 3,101,249 short tons of lignite, value $10,277,539. The coal output is increasing, as 245,300 tons more were mined in January, 1923, than in the corresponding month last year. In January, 1922, 829 tons of domestic were shipped to Ontario, while in January this year 5,239 tons were sent. Shipments to adjacent provinces also are growing, so that it is clear that the campaign being carried on bythe Alberta collieries, assisted by the Provincial and Federal Governments is already bringing results. The Mountain Park, Cadomin, and Liscar mines are collectively employing between 1,200 and 1,300 men, and are turning out approximately 100 carloads of high-grade bituminous coal daily. The Stirling mine is producing up to 2,000 tons daily; the Balkin, Coal Valley, Foothills, Blackstone, and Mile 54 aggregate some 1,800 tons per day, and the Coal Valley makes 600 daily.

The Scientific and Industrial Research Council of Alberta is continuing its experimental work on methods of improving the coals of Alberta, with particular reference to carbonizing and briquetting, and at the same time very satisfactory progress is being made with its experiments on the extraction of bitumen from the bituminous sands of the Athabaska river district.

British Columbia—B. C. shows a very creditable increase in output, mostly due to successful development of mines in the north-west section of the province. The production for 1922 was 175,558 oz. fine, equal in value to $3,269,106, or an increase of 17.8 per cent. The Nickel Plate mine at Hedley will reopen in March; the mill was closed in December to allow the development work at the mine to get ahead.

Silver production amounted to 6,279,486 oz. fine, in which the successful development of the Premier mine was a factor. The report of the Premier mine is interesting. The "income, profit and loss account" for 1922 shows the gross value of ore sold as $4,782,885.43; operating and miscellaneous expenses as $1,022,506.64; leaving $3,760,378.79 as earnings from the mine operations. The tenor of the report is conservative, but shows faith in the future of the mine.

Copper output was 32,432,521 lbs., value $4,340,120. The output of the Granby Mining, Smelting and Power Co. at Anyox remained about the same as in other years, although the copper industry as a whole suffered a severe decline. Mr. J. J. Warren, president, Consolidated Mining and Smelting Co., announced the resumption of operations in the Rossland district as soon as the concentrator at the Sullivan mine at Kimberley is completed.

Lead equalled 87,083,153 lbs., produced as lead bullion at Trail. The Cork Province Mining Co. is again preparing to begin milling operations. Work during the winter has been confined to exploration. The average value of the lead concentrate at this mine is 55 per cent. Pb. and 40 oz. Ag., and the zinc concentrates carry 45 per cent. Zn. and 7 oz. Ag. Accounts have been received of striking mining activity at the Sullivan mine. The present output of the Sullivan is 1,100 tons per day, but the capacity of the new concentrator now nearing completion will be 1,500 tons daily.

Zinc—The total Canadian production was obtained from B. C. amounting to 56,397,500 lbs., mostly from the Trail smelters. Coal was mined to the extent of 2,926,832 short tons, with a value of $14,739,525.

Some $95,000 is expected to be spent by the Provincial Government next summer in road construction in the Portland Canal Mining District.

GERMAN DYE WORKS CLOSED DOWN.

Recent reports would appear to indicate that not only is Ludwigshaven closed down, but the Badische Anilin und Sodafabrik and the Oppau Works are in a similar plight owing to shortage of fuel. Hoechst is only working partially, and the position in Elberfeld is also very difficult. The one bright spot would appear to be at the Leverkusen works, in the British zone of occupation, but even here production has a tendency to decrease. It is stated that stocks of dyes will last another five months, and that plants are being kept in order.

Discussing the Ruhr situation recently, Mr. Francis P Garvan, head of the Chemical Foundation in the United States, said: "Just figure it out. The cartel manufactures 240,000,000 lbs. The world needs 350,000,000 lbs. of dyes. That is what it used in 1913. According to the figures of last year, every month that the cartel is not allowed to work there is a shortage of twenty million pounds throughout the world. Twenty million pounds is thrown open for you (the American manufacturers) to obtain a partial share of that market."

THE MILTON HERSEY SCHOLARSHIP.

A scholarship open to graduates in Agriculture, Science, or Arts has been established in Macdonald College through the generosity of Dr. Milton Hersey, of Montreal.

In awarding this scholarship preference will be given to students who have had sufficient training in Chemistry, and sufficient contact with Agriculture to enter upon a graduate course in Agriculture Chemistry leading to the degree of M.Sc. in McGill University.

The amount of the scholarship is **four hundred dollars,** an amount sufficient to provide for one year's expenses at Macdonald College.

The course includes advanced lectures, tutorials and seminaries in Chemistry and related sciences—Bacteriology, Botany, Entomology, Physics and Zoology—or in the practical agricultural subjects.

Applications are to be made to Principal F. C. Harrison, Macdonald College, Que., and should be accompanied by evidence of qualifications.

Chemical Society News

Containing Official Announcements of the Canadian Institute of Chemistry

AUDITOR'S STATEMENT OF ACCOUNTS AND FINANCIAL CONDITION OF CANADIAN INSTITUTE OF CHEMISTRY FOR PERIOD MAY 24th, 1922, TO APRIL 30th, 1923

CASH RECEIPTS AND DISBURSEMENTS

GENERAL ACCOUNT

May 24th, 1922, to December 31st, 1922

RECEIPTS

Balance in bank and on hand, May 24th	$589.55	
Annual dues of Fellows and Associates	135.30	
Student's fees	135.00	
Entrance fees of Fellows and Associates	120.00	
Interest coupons	27.50	
Sale of furniture	30.00	
Sale of Blue Book	1.00	
		$1,038.35

DISBURSEMENTS

Office equipment	$40.79	
Printing and stationery	128.79	
Postage	42.50	
Secretary's Stenographic allowance	320.00	
President's and treasurer's stenographic allowances	35.00	
President's travelling expenses to Halifax	20.00	
Secretary's travelling expenses to Kingston	12.45	
Travelling expenses to September meeting of Council	82.80	
Subscriptions of new members to Journal	19.50	
Mr. S. J. Cook's report on remuneration of chemists	15.00	
Stenographic report of annual meeting	97.80	
Grant fo Queen's University students' branch	10.00	
Fee to Secretary of State	2.00	
Express on books, etc. from Montreal office	7.69	
Freight	1.63	
Office supplies	16.75	
Exchange	1.45	
Transfer to savings a/c	30.00	
Cheque returned	20.00	
	$904.15	
Balance in bank	134.20	
		$1,038.35

Balance in bank, per bank book	$175.65	
Balance per books as above	134.20	
Difference	$ 42.45	
Accounted for by cheques outstanding—		
No. 30	$ 7.50	
No. 31	9.50	
No. 32	18.29	
No. 33	7.16	
	$42.45	

STATEMENT OF SURPLUS

December 31st, 1922

Surplus as at May 24th		$2,066.18
Reduction to December 31st		496.77
Surplus—December 31st		$1,569.41

ASSETS

Cash—General Account			$134.20
Cash—Savings Account			20.35
Victory Bond			1,003.28
Furniture		$518.00	
Less Sale	$30.00		
Depreciation	183.64		
		$213.64	
		304.36	
Added		40.79	
			345.15
Library			16.82
Scrap book			20.45
Cheque (returned) receivable			20.00
Accrued interest			9.16
			$1,569.41

CASH STATEMENT JANUARY 1st TO APRIL 30th, 1923

GENERAL ACCOUNT

RECEIPTS

Balance on hand, January 1st	$ 134.20	
Annual dues of Fellows and Associates	1,769.63	
Students' fees	36.00	
Entrance fees of Fellows and Associates	50.00	
Sale of furniture	73.00	
Refund from University of Toronto, E. G. R. Ardagh Express	25.00	
Duplicate cheque covering amount charged back in 1922	20.00	
		$2,107.83

DISBURSEMENTS

Subscriptions to Journal	$554.00	
Secretary's stenographic service	210.00	
Fee to Secretary of State	2.00	
Postage, etc	20.00	
Stationery	8.69	
Travelling Expense, Dr. A. C. Neish to Toronto	12.55	
Exchange	14.02	
Cheque charged back	5.00	
	$826.26	
Balance—Cash on hand	20.00	
Cash in Bank	1,261.57	
		$2,107.83

Balance in bank per bank book	$1,352.26	
Balance per books as above	1,261.57	
Difference	$90.69	
Accounted for by cheques outstanding—		
No. 38	$2.00	
No. 40	8.69	
No. 41	80.00	
	$90.69	

STATEMENT OF SURPLUS, APRIL 30th, 1923

ASSETS

Cash—General Account, on hand	$20.00	
Cash—General Account, in bank	1,261.57	
Cash—Savings Account, in bank	20.35	
Victory bond	1,003.28	
Coupons due	27.50	
Cheque receivable (returned N.S.F.)	5.00	
Stenographic service paid in advance	40.00	
Furniture and equipment	190.79	
Library	1.00	
Scrap book	1.00	
		$2,570.49
DEDUCT LIABILITIES—		
Dues paid for 1924	$5.00	
Accounts for Printing	36.30	
Due for subscriptions	6.00	
		47.30
Excess of Assets—representing surplus		$2,523.19

NOTE:—Above is subject to a possible obligation of 1,000 francs on account of the International Chemical Union, not yet passed.

W. S. FERGUSON,
Chartered Accountant.

AMERICAN LEATHER CHEMISTS PLAN INTERESTING CONVENTION.

All who are interested in the tanning and allied industries are invited to attend the annual convention of the American Leather Chemists' Association at the Greenbrier Hotel, White Sulphur Springs, West Virginia, June 7-8-9 next. Several very important papers on subjects of the greatest interest to the tanning industry will be read and discussed. Analytical methods which determine the value of materials entering into the making of leather and of leather itself will be discussed with a view to their standardization. All values must have a standard of measurement, and it is in the standardization of these measurements that the Leather Chemists' Association finds its highest function. Apart from the sessions, arrangements have been made for the entertainment of the ladies, golf, and other recreations. Full particulars may be obtained from the office of the secretary of the association, 22 East 16th Street, New York.

PERSONAL.

Mr. H. W. Powell, formerly Assistant Chemist, has been appointed Director of the Dominion Canners' Research Laboratory, Brighton, Ont.

Mr. E. W. McHenry, formerly Lecturer in Chemistry, Royal College of Dental Surgeons, University of Toronto, has been appointed Assistant Chemist in the Dominion Canners' Research Laboratory, Brighton, Ont.

A Model Incorporation Bill for Chemists

An Act to Incorporate the Association of Professional Chemists of Quebec.

REPORT OF LEGISLATION COMMITTEE.

To the Members of the Canadian Institute of Chemistry:

Dear Sirs: The members of the Legislation Committee feel that a brief statement should be made in regard to the draft of the "Revision of By-Laws" and the "Model Bill," which are herewith submitted to the members.

Following the precedent of our friends the Engineers, no mention is made in the Bill of the Canadian Institute of Chemistry. It is, of course, understood, however, that any action instituted would be initiated by the Institute as a Federal body which would correlate the different Bills as petitioned in the various provinces. The committee also wish it to be clearly understood that both drafts are submitted only as a basis for discussion, which was requested by the general membership at the last annual meeting. In accordance with the expressed wish of the President, both the Revision of By-Laws and the Model Bill have been printed in the May Journal in order that all members may have opportunity of carefully studying them and so be able to come to the Annual Meeting prepared to take an active part in the discussion.

It will be noted that one member of this committee is not in agreement with the other three members, and at his request his name has been withheld from the signatures attached to the respective drafts.

In regard to the "Revision of By-Laws," it will be noted that, with two exceptions no provision has been made for examinations, because it is believed that this is better left in the hands of the Universities, particularly as the Institute expects to have a voice in the matter of University Courses as affecting Chemistry; and, further, because, at this time, the Institute has not the facilities, either in money, staff, or laboratories to handle examinations adequately.

The change in representation affecting Ontario and Quebec has been suggested in order to secure representation for the cities referred to, and thus a more general representation from each province. The provision for Provincial Sections is a necessity in connection with future legislation, and that for Branches is intended to facilitate local camaraderie and esprit de corps.

These reports are submitted by the Committee in the interest and at the request of the general membership of the Institute.

Yours truly,

A. T. CHARRON,
L. F. GOODWIN,
HAROLD J. ROAST (Chairman).

The following draft of a "Model Bill" for Chemists has been drawn up taking Quebec as a type. For other Provinces, substitute the name of said province, and possibly omit clause relative to "Language for Examinations."

WHEREAS a petition has been presented praying that the qualifications necessary to permit persons to act or practice as Professional Chemists be established by legislation;

AND WHEREAS it is expedient to grant the prayer of the said petition;

THEREFORE, His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Quebec, enacts as follows:

1. This Act may be cited as the "Chemical Profession Act."

INTERPRETATION

2. In this Act, unless the context otherwise requires the expression:

(a) "Professional Chemist" means any person registered as a Professional Chemist under the provisions of this Act;

(b) The "Practice of Professional Chemistry" means the carrying on for hire, gain, or hope of reward of any branch of Organic, Inorganic, Metallurgical, Biological or Analytical Chemistry; Pharmaceutical Chemistry being excepted;

(c) "The Association" means the Association of Professional Chemists of the Province of Quebec;

(d) "Council" means the Executive Council of the Association;

(e) "President" means the President of the Association;

(f) "Registrar" means the Registrar of the Association;

(g) "The Secretary" means the Secretary-Treasurer of the Association;

(h) "Board" means the Board of Examiners of the Association;

(i) "Registration" means the admission of a Chemist to membership in the Association and the enrolment of his name in the Register; and "Certificate of Registration" means the official certificate under the seal of the Association evidencing the same;

(j) "Licensed" means that permission has been given to a non-resident Chemist to temporarily practise professional chemistry without being registered, and "License" means the official certificate under the seal of the Association evidencing such permission.

THE ASSOCIATION OF PROFESSIONAL CHEMISTS OF THE PROVINCE OF QUEBEC

3. (a) All persons registered as Professional Chemists under the provisions of this Act are hereby constituted "The Association of Professional Chemists of the Province of Quebec," and shall be a body politic and corporate, with perpetual succession and a common seal;

(b) The head office of the Association shall be at Montreal, Quebec.

4. The Association shall have power to acquire and hold real property not producing at any time an annual income in excess of ten thousand dollars, and personal property, and to alienate mortgage, lease or otherwise charge or dispose of the same or any part thereof as occasion may require, and to sue and be sued.

5. The Association may pass by-laws not inconsistent with the provisions of this Act, regarding:

(a) The election of the Executive Council of the Association;

(b) The government, discipline and honour of the Members;

(c) The maintenance of the Association and the management of its property;

(d) The fixing of an annual fee not in excess of fifteen dollars, and other fees;

(e) The levying, remission and collecting of annual and other fees;

(f) The examination and admission of candidates to the study and practice of Professional Chemistry;

(g) The calling and conduct of meetings, voting, quorum and general business, banking, borrowing and credits;

(h) All other purposes reasonably necessary for the management of the Association.

6. (a) All by-laws or amendments thereto shall become effective only after ratification by two-thirds majority of the votes received from the Members of the Association in good standing at a meeting duly convened. The Registrar shall file with the Lieutenant-Governor in Council a copy of each by-law or any amendment thereto, immediately the same is ratified, certified under the seal of the Association as a true copy;

(b) Notwithstanding anything in this Act contained, any by-law may be disallowed by the Lieutenant-Governor in Council.

WHO MAY PRACTISE

7. (a) Only such persons who are Members of the Association and registered as such under the provisions of this Act, or who have received a License from the Council of the Association

as hereinafter provided, shall be entitled within the Province of Quebec to take and use the title of "Professional Chemist," or any abbreviation thereof, or to engage in the Practice of "Professional Chemistry:"

(b) Any person residing in the Province of Quebec at the date of the passing of this Act, who is at that date, and has been for five years previously practising Professional Chemistry as defined in Sub-section (b) of Section 2, shall be entitled to be duly registered as a Member of the Association without examination; provided that such person shall produce to the Council, on or before the first day of April, 1924, satisfactory credentials of his qualifications;

(c) Chemists who were practising previous to the late war and who were accepted for services in the forces of the British Empire, or any of its Allies, shall be entitled to all the rights and privileges conferred under Sub-section (b) of this Section;

(d) Any person who may hereafter come to the Province of Quebec, and who shall produce to the Council a satisfactory certificate signed by the proper officers evidencing the fact that he is a duly registered member in good standing of an Association of Chemists in the Dominion of Canada, having equivalent standards of qualification for membership to this Association, together with an application for registration in this Association endorsed by the Registrar of such other Association, may become a duly Registered Member of the Association without the payment of the annual fee for the year in which he joins but shall pay a fee of five dollars for such registration;

(e) Any person not otherwise qualified as hereinbefore mentioned, before being admitted as a Registered Member of the Association shall make application to the Council, and shall produce credentials satisfactory to the Council, or in lieu thereof pass the prescribed examination, and shall pay the prescribed fees;

(f) Any person who is employed as a Chemist by a public service corporation, a public utilities or government department, whose business is normally carried on in two or more of the Provinces of Canada, and who is by reason of his employment required to practise as a Chemist in other Provinces than that of his residence, may so practise in the Province of Quebec without being registered or licensed, or payment of fee;

(g) Any person acting as an assistant to a Professional Chemist where such person is directly responsible for the technical quality of work as set forth in Section 2, Sub-section (b) hereof, must be a Professional Chemist. Any person may otherwise act as an assistant to a Professional Chemist, and shall not be deemed to be practising Professional Chemistry when so engaged;

(h) The provisions of this Act shall not apply to any member of His Majesty's Naval, Military or Aerial Forces while actually employed on duty with such Force.

PARTNERSHIP

8. In the case of two or more persons carrying on the practice of Professional Chemistry in co-partnership, only such members as are registered or licensed under this Act shall individually assume the functions of a Professional Chemist. A firm as such cannot be deemed to be a Member of the Association or be licensed to practise.

COUNCIL

9. (a) The powers conferred on the Association shall be exercised by an Executive Council, which shall consist of a President, Vice-President, and nine Councillors to be chosen from Registered Members of the Association, and who shall hold office as hereinafter provided;

(b) The President shall be elected annually by the Association and shall hold office until his successor is elected. He shall act as Presiding Officer at the meetings of the Council and of the Association, voting only when votes are evenly divided;

(c) The Vice-President shall be elected annually by the Association and shall have all the powers of the President during the absence of the latter;

(d) The last past President shall be a member of the Council. Four Councillors shall be elected annually by a ballot vote, the four having the highest number of votes cast shall be declared duly elected and four Councillors, one of whom must be a Member of the Faculty of pure or Applied Science in McGill University, another of whom must be a member of the Faculty of pure or Applied Science in the Universite de Montreal and another of whom shall be a member of the Faculty of pure or Applied Science of Laval University. A fourth shall be appointed annually by the Lieutenant-Governor in Council;

(e) The "Registrar" and the "Secretary," the former of whom must be a Professional Chemist, shall be appointed by the Council within one month after its assumption of office;

(f) The same person may be appointed to the office of both Registrar and Secretary;

(g) The Secretary of the Association shall also be the Secretary of the Council;

(h) The Secretary of the Association shall, on his assumption of office, lodge in the hands of the President of the Council a bond for one thousand dollars in some bonding company satisfactory to the Council. All the expenses arising from the furnishing of such bond shall be borne by the Association;

(i) In case of the resignation or death of any member or members of the Council, the other members of the Council shall have power to fill all vacancies so caused until the time of the holding of the next annual meeting; provided the said annual meeting is not to be held within a period of three months after the occurrence of such vacancy or vacancies.

EXAMINATIONS

10. (a) The Council shall appoint annually a Board of Examiners for each branch of Chemistry as set out in Section 2, Sub-section (b), and shall fill the vacancies in the same as they occur;

(b) The duties of the Board shall be to examine all candidates for admission to membership by examination. As soon as possible, and not later than twenty-one days after the close of each examination, the members of the Board who shall have conducted such examination, shall make and file with the Secretary a certificate showing the results of such examination, whereupon the Council shall notify each candidate of the result of the examination and of their decision upon his application. The members of the Board shall also file with the Secretary the examination papers submitted to each and every candidate, together with the answers of the respective candidates thereto, and shall attach thereto a certified copy of their report, with the marks awarded to each candidate in each subject of such examination, and such documents shall remain on file in the office of the Registrar, and shall be open to inspection by any of the said candidates, or by any person duly authorized in writing on their behalf, during regular office hours for a period of at least six months following the examination.

11. (a) Regular examinations of candidates for registration or license shall be held at Montreal or such other place or places as the Council may direct, beginning on the last Monday in the months of February and November in every year, unless such Monday be a holiday, in which case they shall begin on the next ensuing day not being a holiday;

(b) Special examinations may be granted, provided the candidate or candidates for such special examination deposit in advance with the Registrar a sum sufficient to defray the expenses of such examination and the prescribed examination fees. Any balance remaining over shall be returned to such candidate or candidates;

(c) The scope of the examinations and the methods of procedure shall be prescribed by the Council.

(d) The candidate shall submit to examination before the Board in one or more of the recognized branches of Chemistry, such branch or branches to be selected by the candidate;

(e) Every candidate for examination shall give at least one month's notice in writing to the Secretary of his intention to present himself for examination, and with such notice shall forward a fee of five dollars, and before undergoing examination shall pay to the Association twenty-five dollars as a fee and before receiving his certificate of registration shall pay the annual fee set out in the By-laws and a sum of not more than five dollars for the publication of his name in the Quebec Gazette;

(f) In case the candidate should fail in his examination, he may present himself at any subsequent regular examination by paying a fee of ten dollars.

(g) All examinations shall be conducted in French or English at the option of the Candidate.

REGISTRATION WITHOUT EXAMINATION

12. (a) The Council shall consider an application for registration from any person who submits proof of qualifications possessed by such person by virtue of experience, training or examination by another examining body of recognized standing, and if found satisfactory shall grant a certificate of registration;

(b) Any person who, without examination, is registered as a Professional Chemist, shall pay to the Association before being so registered the sum of fifteen dollars for examination of credentials, and the annual fee set out in the By-laws, and a sum of not more than five dollars for the publication of his name in the Quebec Gazette;

(c) The Board shall examine all degrees, diplomas, certificates and other credentials presented or given in evidence for the purposes of obtaining registration or license to practise, and may require the holder of such credentials to attest by oath or by statutory declaration on any matter involved in his application and shall report the result of its investigation to the Secretary.

13. The Council shall have power to establish conjointly with any Council of any other Association similarly constituted, in one or more of the Provinces of Canada, a Central Examining Board, and to delegate to such Central Examining Board all or any of the powers possessed by the Board respecting the examinations of candidates for admission to practise; provided that any examination conducted by such Central Examining Board shall be held in one place at least within this Province.

14. The Registrar shall keep a Register of all Professional Chemists, showing the dates of their certificates, and shall cause a list of Professional Chemists in good standing who are authorized to practise, to be published in the first issue of the Quebec Gazette on or before February 14th of each year. Should a Professional Chemist omit to pay the prescribed fee on or before January 31st in any year, his name shall be erased from the Register, and should he wish to resume practice he may be again placed on the Register by paying the prescribed annual fees and a further sum sufficient to meet the expenses of having his name published in one issue of the Quebec Gazette.

15. (a) Notwithstanding any other provision of this Act, no person shall be registered unless at least twenty-one years of age, and unless he has been engaged for four years in some branch of Chemistry, except in the case of a graduate from a recognized Chemical College, in which case the period of engagement in Chemical work shall include his term of instruction;

(b) Candidates for admission to practise who, for any reason have been unable to take advantage of an academic Chemical course, must have served at least six years under a Professional Chemist or Chemists or a Chemist or Chemists whose standing is recognized by the Council, and must pass an examination satisfactory to the Board.

16. (a) The Registrar shall issue a "Certificate of Registration" to all Professional Chemists registered under this Act, and to any person entitled thereto upon written instructions from the Council, and upon payment in advance of the prescribed fees. All certificates shall be signed by the President and by the Registrar, and bear the seal of the Association, and shall specify the branch or branches of Chemistry in which the Professional Chemist has been examined or otherwise accepted, and shall operate as a permit to practise for the remainder of the year in which issued, and upon payment of the annual fee in each subsequent year he shall issue an annual certificate, which will operate as a renewal of such permit for that year. The holder of a certificate shall at all times prominently display the same in his office or other place of business;

(b) The Registrar shall issue a license to practise, specifying the period for which it is issued, to any non-resident practitioner entitled to such license, upon payment of the prescribed fee.

17. The Registrar shall keep his Register correct, in accordance with the provisions of this Act, and the rules, orders and regulations of the Council.

18. Each person who is registered or licensed to practise shall pay in advance to the Secretary-Treasurer, or any person deputed by the Council to receive it, such annual fee as may be determined by the By-laws of the Association, which fee shall be deemed to be a debt due by the practitioner and to be recoverable with the costs of same in the name of the Council in any court of competent jurisdiction.

19. No person entitled to be registered under this Act who shall neglect or omit to be so registered, shall be entitled to any of the rights or privileges conferred by the provisions of this Act so long as such neglect or omission shall continue, and any person not registered or licensed under this Act who practises, acts, or advertises himself as a Professional Chemist, save and except as hereinbefore provided, or assumes verbally or otherwise the title of Professional Chemist, or any abbreviation thereof, shall incur a penalty of not less than fifty dollars, and not more than three hundred dollars for every such offence.

20. If the Registrar makes or causes to be made any wilful falsification in any matters relating to the Register, he shall incur a penalty of not less than twenty dollars nor more than five hundred dollars.

21. If any person shall wilfully procure or attempt to procure himself to be registered or licensed under this Act, by making or producing, or causing to be made or produced, any false or fraudulent representation or declaration, either verbally or in writing, every such person so doing, and every person knowingly aiding and assisting him therein, shall incur a penalty of not less than twenty dollars nor more than five hundred dollars.

22. Any information for the recovery of any such penalty or forfeiture may be laid by any Member of the Association, or by any person appointed by the Council.

23. No prosecution shall be commenced for any offence against this Act after two years from the date of committing the offence.

24. The Council may, and upon application of any three Members shall, cause inquiry to be made into matters respecting any fraudulent or incorrect entry in the Register, or the unprofessional conduct, negligence or misconduct in the execution of the duties of his office, or the conviction on a criminal offence of any Registered Member, and may in its discretion order the erasure or correction of any entry in the Register, or may reprimand, censure, suspend or expel from the Association any Member found guilty as aforesaid; provided that the name of a Member shall not be erased from the Register on account of a conviction for a political offence outside His Majesty's Dominions, nor on account of a conviction for an offence which, though within the provisions of this Act, ought not, in the opinion of the Council, either from the trivial nature of the offence or from the circumstances in which it was committed, to disqualify a person from practising Professional Chemistry.

25. The Council may, for the purpose of the execution of the duties of the Council under this Act, employ at the expense of the Association such legal or other assessor or assistant as the Council may think necessary or proper; and any person whose

status or conduct is the subject of inquiry shall also have the right to be represented by counsel.

26. At least one week before the first meeting of the Council to be held for taking evidence or otherwise ascertaining facts, a notice shall be served upon the person whose status or conduct is the subject of inquiry, and such notice shall embody a copy of the charges made against him, or a statement of the subject-matter of the inquiry, and shall also specify the time and place of such meeting. The testimony of witnesses shall be taken under oath, which the Presiding Officer is hereby authorized to administer, and there shall be full right to cross-examine all witnesses called, and to call evidence in defence and reply. In the event of the non-attendance of the person whose status or conduct is the subject of such inquiry, the Council may, upon proof of the personal service of the notice aforesaid in accordance with the provisions of this Section, which proof of service may be by statutory declaration, proceed with the subject-matter of the inquiry in his absence, and make their report of the facts without further notice to such person.

27. The Council, or any person interested in the proceedings on any such inquiry, may make application to the Registrar or any District Registrar of the Supreme Court to seal a writ or writs of subpœna for the attendance of any witness or witnesses and for the production of books, papers and documents by such witness or witnesses at such inquiry in form similar to that prescribed by the Supreme Court Rules, and such writ or writs of subpœna shall have the same force and effect as though issued out of the Supreme Court, and the fees therefor and the rules governing the same shall be such as are in force in the Supreme Court.

28. Any person who has failed to pass an examination, or whose name has been ordered to be erased from the Register, or who feels himself aggrieved, or is affected by any order of the Council, or any decision of the Board of Examiners, may appeal from such order, finding, action, or decision, to any Judge of the Supreme Court at any time within six months from the date of such order, finding, action or decision, or the publication thereof; the said Judge thereof, upon the hearing of such appeal, which may be analogous to appeal to the County Court under the "Summary Convictions Act," may make such order confirming or reversing in whole or in part, or varying the order, finding, action or decision appealed from, or directing further inquiries by the Council into the facts of the case, and as to costs, as to the said Judge thereof shall seem right in the premises. Such order, when so made, shall be final.

29. In all cases where proof of registration under this Act is required to be made, the production of the last annual list published in the Gazette as herein provided, or of a certificate bearing a date subsequent to the issue of the said Gazette containing said annual list, showing that the person or persons therein named is or are duly registered, certified under the hand of the Registrar for the time being and the seal of the Association, shall be sufficient evidence of such registration in lieu of the production of the original Register; and any such certificate purporting to be signed by any person in the capacity of Registrar shall be *prima facie* evidence that such person is such Registrar, without any proof of his signature or of his being in fact such Registrar; provided, always, that the evidence herein aforesaid may be displaced by any certificate of the Registrar under seal of the Association, showing the fact of erasure of any name or suspension or revocation of any licence to practise.

30. Any penalty recoverable under this Act may be recovered in the same manner as penalties are recovered under the "Summary Convictions Act," before any Justice of the Peace having jurisdiction in the locality in which the offence was committed, and every such penalty may, together with the costs of conviction be levied by distress and sale of the goods and chattels of the offender.

31. Within one month after this Act comes into force, the Lieutenant-Governor in Council shall appoint a provisional Council, consisting of eleven members, who shall elect their own officers.

At least one member shall be chosen from practitioners in each of the branches of Chemistry named in Section 2, Sub-section (b) hereof.

32. The duties of the Provisional Council shall be to provide the Register called for by this Act, to enter therein the names of those and those only who are entitled to registration under the provisions of Section 7, Sub-section (b), and who apply in writing to be registered and pay the prescribed fees, and to call within six months from the coming into force of this Act the first general meeting of the Association, for the purpose of electing the regular Council and any other organization purposes of the Association and shall have the powers conferred in this Act on the Council of the Association. Their powers shall cease on the election of the regular Council of the Association.

33. Every person registered under this Act shall have a seal, the impression of which shall contain the name of the Chemist, the branch of Chemistry in which he has been accepted, and the words "Professional Chemist, Province of Quebec," with which he shall stamp all official estimates, specifications, reports, documents and plans.

34. No provisions of this Act restricting the practice of the profession or imposing penalties shall take effect until the first day of April, 1924.

35. Nothing in this Act contained shall be construed as altering or affecting any provisions of the Coal-mines Regulation Act, Metalliferous Mines Inspection Act, or the Pharmaceutical Act.

36. Nothing in this Act contained shall be construed as preventing the carrying on by any person on his own property of any work for the sole use of himself and his domestic establishment; provided, however, that such work shall not involve the safety of the general public.

37. No person practising the profession of Chemistry, and not entitled to do so under this section, shall recover before any court of Justice any sum of money for the professional services rendered in such capacity.

This Draft Bill is submitted as a majority report of the Legislation Committee of the Canadian Institute of Chemistry. Legislation Committee members in agreement on Draft Bill:

A. T. CHARRON,
L. F. GOODWIN,
HAROLD J. ROAST, *Chairman*

NOTE—This draft bill is based upon the bill brought in by the Engineering Institute of Canada for the engineering profession, to whom acknowledgment is hereby made.

PROPOSED ALTERATIONS IN BY-LAWS, CANADIAN INSTITUTE OF CHEMISTRY.

Report of Legislation Committee Canadian Institute of Chemistry on Revision of By-laws, March 16, 1923

This report has been based upon careful consideration of the following:

1. The comments and suggestions of the various members of the Legislation Committee (which have been circulated among all the members.)
2. The comments appearing in the journal.
3. The suggestions from the meeting of Council held in Toronto.
4. The few letters received by the Chairman from individuals.

While it has naturally not been possible to incorporate all the suggestions received, many of which overlapped, an

earnest endeavor has been made to get the best average obtainable.

Nos. of By-laws refer to those used in the "Blue Book."

We advise that the present By-laws remain as they are, with the following exceptions:—

By-law 1, line 3, change "Directors" to "Council."

By-law 5. Change to read as follows:—

"FELLOWS"

The following shall be the requirements and qualifications for membership as Fellows, providing that all applicants shall be of the age of twenty-five years or over, and that their applications shall bear the signatures of three Fellows of the Institute.

"A" 1. One who has obtained a degree from a university or college recognized by the Council, after having completed a four-year course in Chemistry or Science with Chemistry as his major subject, AND

2. Who has had in addition, not less than four years' experience in Chemistry in a responsible capacity, as recognized by the Council of the Institute. In the event of an applicant satisfying council that he has had a five year course of training in Chemistry at a university or universities or college or colleges recognized by Council, only three years' experience in Chemistry in a responsible capacity as recognized by Council shall be required.

"B" 1. One who has obtained a degree from a university or college recognized by the Council, after having completed a three-year course in Chemistry or Science with Chemistry as the major subject, AND

2. Who has taken a further year's training in Chemistry at a recognized university or college, OR

3. Who has had two years approved training under a Fellow of the Institute, or in a laboratory or works approved by Council, AND

4. Who has had in addition, not less than four years' experience in Chemistry in a responsible capacity, as recognized by the Council of the Institute.

"C" 1. One who has carried out original research, or has devised processes or inventions of sufficient merit, in the opinion of Council, AND

2. Is possessed of knowledge and experience equivalent in the opinion of Council, to that required under "A" or "B" respectively, AND

3. Has held a position of professional responsibility in pure or applied Chemistry for not less than ten years.

By-law 6. Change to read as follows:—

"ASSOCIATES"

The following shall be the requirements and qualifications for membership as Associates, providing that all applicants shall be of the age of twenty-one years or over, and that their applications shall bear the signatures of three Fellows of the Institute.

"D" One who qualifies under "A" 1 for the requirements for Fellows, OR

"E" One who qualifies under "B" 1 and 2 or "B" 1 and 3 for the requirements for Fellows, OR

"F" One who produces satisfactory evidence of a good general education represented by his having passed a matriculation examination or such other equivalent examination admitted by a university or college recognized by the Institute, AND

2. Has been continually engaged in the study and practice of Chemistry in a manner satisfactory to the Council, either by day or evening classes, for not less than three years, AND

3. Has had four additional years' approved training in Chemistry under a Fellow of the Institute, or in a laboratory or works approved by the Council.

By-law No. 7.—Change to read as follows:—

STUDENTS

The following shall be the requirements and qualifications for Student membership, providing that all applicants shall be at least seventeen years of age, and shall produce satisfactory evidence of a good general education represented by their having passed a matriculation examination or such equivalent examination admitted by a university or college recognized by the Institute.

"G" One who is a student at a recognized university, college or school, and is taking Chemistry as a major subject, OR

"H" One who is a pupil of a Fellow of the Institute, OR

"I" One who is engaged in a laboratory or works approved by the Council with the intention of qualifying for Associate membership in the Institute.

Renumber By-laws from 8 on to allow of the introduction of a new By-law as No. 8 and others later.

By-law No. 8 to read as follows:—

New

Any Student member or Associate may, when he considers himself qualified, make application to the Secretary for admission to the Associateship or Fellowship respectively, whereupon the Secretary shall put such application before Council, and if Council considers that the applicant is qualified, he shall be duly admitted upon payment of the necessary fee.

Old By-law No. 8 to be changed as follows:—

Paragraph 3, line 2, delete "or treasurer," and delete the whole of Paragraph 5, commencing "Of the fifteen members."

Paragraph 9, change to read "Members of the Council or the Institute or any of them, may be paid, out of the funds voted by the Institute for specific purposes, such sums of money as the Council may recommend as remuneration for their services, or any out-of-pocket disbursements."

Delete the last paragraph, commencing "if any councillor."

Old By-law 9, paragraph 3, line 4, after word "place," change to following:—

"Such notices shall specify the time, place, aud purpose of such meeting."

Old By-law 11, paragraph 1, line 6, substitute "Institute for "Corporation."

Old By-law 12, paragraph 2, line 2, substitute "30th April" for "31st December."

Old By-law 12, paragraph 4, line 1, substitute "30th April" for "31st December."

Add another paragraph No. 6, as follows:—

"The Institute shall nominate and elect, at the annual meeting, an Auditor for the ensuing year who shall examine and audit the accounts of the treasurer for the current year, and shall submit a report, upon the financial statement of the Treasurer, to the Council for presentation at the annual meeting of the Institute. The Auditor shall have power to call for all accounts, vouchers, minutes, books, bonds and other papers and information which may be necessary for a complete audit of the financial affairs of the Institute.

By-law 13, paragraph 4—*New.*

"Only Fellows and Associates shall be qualified to become members of the several committees.

By-law 14, paragraph 1, line 2, delete "It shall employ an expert accountant to audit the books and submit the annual statement."

Paragraph 1, line 6, substitute "Institute" for "Corporation."

By-law 18, paragraph 3, line 2, delete "Any member shall have the privilege of adding any names or names which he may desire," and replace by "Any Fellow or Associate shall have the right and privilege of adding any name, or names, which he or she, may desire, provided always that the consent of such nominee, or nominees, has, or have been obtained in writing, by the nominator."

Paragraph 3, line 10, insert commas, after members, standing.

Paragraph 3, line 11, delete from "The ballot . . . . votes elected to office," and substitute "All ballots received by the Secretary before the election of scrutineers, at the annual meeting, shall be valid. The members assembled at the annual meeting shall elect three scrutineers, and the Secretary shall deliver to them all the ballot envelopes received by him. The scrutineers shall at once proceed to open the sealed envelopes, count and canvas the ballots cast for the various nominees, and make a report, in writing, at the annual meeting, of the result of their scruitny of the ballots. The President, or Chairman, shall declare the nominee or nominees receiving the largest number of votes elected to office. In case of a tie vote, between two or more of the nominees, the presiding official shall cast the deciding vote.

Paragraph 4, commencing "Providing that representation, etc." change to read as follows:—

Provided that representation on the Council shall be given to each Province and City as follows:—
British Columbia 1; Alberta, 1; Saskatchewan, 1; Manitoba, 1; Nova Scotia, 1; New Brunswick and Prince Edward Island, 1; Ontario, 5, which shall be so distributed that Kingston, Ottawa and Toronto shall each have at least one member; Quebec, 4, which shall be so distributed that Quebec and Montreal shall each have at least one member. Provided however that commencing in 1925, the Council shall consist of seventeen members, fifteen of whom shall be elected from the eight different provinces and cities above mentioned, in proportion to the number of members which each province and city has upon the roll of membership of the Institute at that time. Each province and city above mentioned shall however, have at least one member.

Paragraph "In case of a tie" etc., delete this paragraph.

By-law 19, paragraph 2, line 2—Substitute "30th April" for "31st December."

Paragraph 2, line 5—Substitute "Institute" for "Council."

Paragraph 2, line 8, "Any other ordinary or special business . . . . before the meeting." Replace by "The meeting may consider any ordinary business concerning the Institute which may be brought before it, and also all such special business, or motions, of which due notice has been given in accordance with the By-laws, providing that all ordinary or special business of which notice in writing has been received by the Secretary not later than one month prior to the annual meeting shall have precedence on the Agenda. The said agenda shall be drawn up by the Secretary and approved by Council, and shall be brought before the meeting in the order approved by Council at its meeting immediately before the annual meeting.

By-law 23, paragraph 3—Substitute "first day of November" for "October."

By-law 23—Delete last paragraph.

By-law 25, paragraph 1, line 4—Change "Corporation" to "Institute."

By-law 22—Change to:—

"Provincial Sections"

Provincial Sections shall be established upon the requisition of ten members of the Institute, Fellows and Associates together, and when formed shall be distinguished by the name of the province, as, for example, The Ontario Section of the Canadian Institute of Chemistry.

Membership of a Section shall consist of the members of the Institute resident in the said province.

Provincial Sections shall elect from their own number, an Executive Committee, consisting of a Chairman, and Secretary-Treasurer, or Secretary and Treasurer, and other members. The immediate past Chairman of the provincial Section, and any members of Council who are resident within the province shall be ex-officio members of the executive committee.

From paragraph 4 onwards, the By-law remains the same except for the substitution of "Provincial Section" or "Provincial Sections" for "Branch" or "Branches."

Insert new By-law after 22, thus:—

"Branches"

Branches may be established upon the advice of members of Council, upon the requisition of five members of the Institute, Fellows and Associates together, and shall be known by the name of that City, Town or University forming the centre of its activities. Membership of a Branch shall consist of members of the Institute residing within its jurisdiction.

From paragraph 3 on of By-law 22, the By-law relating to Branches to be the same as those for Provincial Sections except that "Branch" or "Branches" be substitute for "Provincial Section" or "Provincial Sections."

All By-laws to be re-numbered consecutively—28 By-laws in all.

The above changes and additions to the By-laws are recommended by a majority report of the Legislation Committee, as undersigned:—

L. F. Goodwin A. T. Charron
Harold J. Roast (Chairman)

The International Union of Pure and Applied Chemistry and Canadian Chemists.

By A. T. Charron, D.Sc., F.C.I.C., and Georges H. Baril, M.D., D.Sc., F.C.I.C.

THE letter of Sir William Pope, president of the International Union of Pure and Applied Chemistry, published in the March issue of Canadian Chemistry and Metallurgy, has called the attention of Canadian chemists to the activities of that excellent organization. After reading this letter should there still be any hesitation about Canada maintaining its adhesion to this international scientific body? We do not think so.

The undersigned, each having had the privilege of attending one of the important annual conferences of this International Union, one in Brussels and the other in Lyons, deem it their duty to enlarge somewhat on Sir William Pope's statement and emphasize the following facts:

1. The work accomplished by the International Union is so extensive that Sir William Pope's letter covers only a very small portion and of necessity our own brief comments are far from covering the whole field. One must not forget that the International Union of Pure and Applied Chemistry is still in the preliminary phase of its organization, and, therefore, one cannot expect a large sum of tangible results to be available.

2. Canadian chemists are bound to derive the greatest advantage from their co-operation with the activities of the Union without, for that purpose, being required to neglect giving proper attention to our own national problems.

But, after all, what is the International Union of Pure and Applied Chemistry? It is an organization whose main object is to establish bonds between and bring together the various chemical societies of the adhering countries for the purpose of:

(a) Establishing amongst them a permanent co-operation.

(b) Co-ordinating their efforts and their scientific and technical activities so as to secure a better and more complete documentation; the co-operative pursuit of certain investigations; the unification of analytical methods; the establishment of chemical and physical constants; the standardization of technical and industrial methods, etc.

3. Creating an international centre, wherein all presently available chemical information—a complete collection of

all international intellectual production in every branch of chemistry—may be methodically collected together with the establishment of a museum containing a collection of standard raw materials, and products of chemical origin.

To attain this object the International Union organizes:

(a) Annual conventions, held in turn in the various adhering countries, at which the regularly appointed delegates discuss problems of general interest, receive and scrutinize the reports presented by the permanent committees.

(b) Local investigations in the various countries in relation to the problems submitted at the annual convention. These investigations are carried on under the direction of permanent committees whose members remain in function for a period of three years and a written report of such activities is presented to the Executive Council of the Union yearly.

As soon as circumstances will allow, a large consulting committee will be formed for the purpose of insuring adequate representation in the Union to all branches of pure and applied chemistry so that all chemical problems may receive proper attention. This committee will comprise 35 sections, including all the various sub-divisions of chemistry such as: Physical chemistry; mineral chemistry; organic chemistry; biological chemistry; agricultural chemistry; analytical chemistry; shop appliances; laboratory appliances; gas and coke industry; hydrocarbons and petroleum industries; wood distillation and derivatives; cold storage industry; metallurgy and electro-metallurgy; precious metals; large chemical industry; lime; cements and building material industries; glass works; ceramics; small chemical industries; rare earths, radioactive bodies; coloring matters, pharmaceutical and photographic products; powders and explosives; essences, natural and synthetic perfumes; resins, paints, laquers, varnishes, waxes; rubber and rubber substitutes; fats; soaps, candles, glycerine, cellulose, paper, pulp and artificial textiles; bleaching, dyes and printing preparations; tinctorial extracts and tanning materials; fermentation industries, wine making, cider making, brewery, distillery; sugar manufacture, starch and glucose making; dairy; food products.

Canada Has Direct Interest in Problems of International Union.

The adhering members of the International Union represent 24 different countries. Every year new countries seek admittance, and up to date not one has ever signified any intention of withdrawing. Shall Canada be the first to take such a step? Shall we withdraw before we have given this newly-formed organism a chance to complete its organization and show what it can do? We believe that this would be rather unwise. This negative argument, we are quite aware, would have but little weight with the majority if it was not supported by more positive motives. But we are directly interested in many problems which have already been brought to the attention of the members of the Union at their various annual conventions:

Let us quote a few of these from memory:

(a) The reform of the chemical nomenclature. No one will deny that this problem can only be solved by an international commission. The ambiguity of chemical names is an evil deplored by everybody, but more especially by students in chemistry. The co-operation of all chemical authorities must be enlisted to wipe it out. I am not aware that any of our chemists would have the pretention of attempting to create a purely Canadian chemical nomenclature and ignore the decisions arrived by the chemists of other countries in an international conference.

(b) The unification and standardization of analytical methods. What an advantage for the proper interpretation of analytical results when analytical methods will have been standardized in the chemical world? How much more easy it will become to expose frauds and protect the honest industries? This, again, can only be attained rapidly by the co-operation and united efforts of the members of a large International Union.

(a) A central place where samples of substances of definite Union's life, we can derive immense benefits from the International Institute of Chemical Standards which has been organized and is functioning under three district subdivisions:

1. A central place where samples of substances of definite chemical compositions are collected and critically examined as to their degree of purity and their physical constants determined with the greatest accuracy. These are available to research workers and furnishes them with a standard uniform basis for their work. This bureau is to be found at the University of Brussels, Rue des Sols, and is known as the Bureau of Physico-chemical Standards.

(b) A centre of production of chemically pure products for research work.[1] This bureau is stationed in London.

(c) A bureau of documentation in which will be centralized, after it has been obtained from the producers, all information which may be of interest to chemists, and which will be available to them upon request, thus saving them the trouble of personally writing to each country to obtain the data which they require. This bureau has its headquarters in the office of the general secretary of the International Union, 49 Rue des Mathurins, Paris, France.

The preparation of the table of constants is also work which requires co-operation. A chemist who needs those tables in his specialty should not think that he has accomplished his whole duty when he has bought one of them. Should he not feel in duty bound to co-operate his share towards the improvement of those tables?

We have so far mentioned only a few of the problems to which are devoted the activities of the International Union. Our chemists must know that all the branches of chemical science are the object of special study. Besides the committees already mentioned, there are several others functioning regularly, such as the International Committee of Chemical Elements, the International Committee of Bibliographic Documentation, the International Committee of Food Conservation, the International Committee for the Study of Fuel and Ceramics, the International Committee of Scientific and Industrial Patents, the International Committee of Industrial Hygiene.

Far be it from us to advocate that international problems should be given more importance than our national problems; nevertheless, we claim that we cannot segregate ourselves and refuse to accept our share of international activities. If we wish to profit from the work carried on in other countries, we have to collaborate, within reasonable limits, towards the advancement of science. We are constantly in relation with other countries. We import from them in every sphere, both material and intellectual. In the latter especially, are we dependent in a very large measure upon such countries as France, England, Germany, and the United States. Shall we be satisfied when we have contributed money for the purchase of books and scientific periodicals?

Have we as chemists ever thoughtfully pondered over the fact that the students of our Universities are visiting foreign countries more and more in their search for more extensive training in the sciences and their applications? If Canada should stay out of the international scientific movement what kind of a reception will those students get? Will they not be welcomed more sympathetically if

they come from a country which is willingly doing its share towards the development of that gigantic work? Surely, our contribution to international institutions such as the International Union of Pure and Applied Chemistry is one of the best means to insure a welcome to our scientific students when they go abroad.

In the March issue, to which we alluded at the outset of this article, are mentioned the names of Canadian chemists who have been appointed members of the various committees. It seems to us that it would be a good move for those who feel that they have time to contribute to the work, which is especially entrusted to these officials, to send in their names to them so that they may profit from their valuable co-operation. These officials only form the nucleus around which should be grouped our activities.

The value of the reports of the various committees at the convention of the International Union will depend upon the co-operation which will be given by the members.

DEVELOPMENT OF ELECTROLYTIC IRON.

A very interesting paper on "Electrolytic Iron" was given by Mr. R. F. Traill, F.C.I.C., research chemist of the Ore Dressing and Metallurgical Division of the Mines Branch, Ottawa, before the members of the Ottawa Section, Society of Chemical Industry, at the regular meeting held at the University Club, April 12th. Mr. F. J. Hambly, chairman, presided.

The Publicity Committee reported that several papers were about ready for publication, and that means should be found for giving greater circulation to such papers. It was suggested that the matter be taken up at the annual meeting in Toronto with a view to having simultaneous publication in Ottawa, Montreal and Toronto papers. The importance of such publicity work was stressed by Dr. van der Linde, of Toronto.

The amendments to the Patent Bill as suggested by the Section Committee were described by Dr. Tingle.

Mr. Traill's paper on "Electrolytic Iron" reviewed briefly the work of the earliest investigators, tracing the development of the electrolytic iron process to date. An abstract of his paper will appear in our June issue.

NEW CEREAL LABORATORY ESTABLISHED.

Mr. Rae H. Harris, recently appointed chemist for the Quaker Oats Co., of Saskatoon, has added another laboratory to the large number guiding Canadian industries. This laboratory is equipped for all general analytical work, and is arranged to carry out tests on all cereal products handled. An experimental bake-shop, with large electric oven, has been put in.

The direct connection with the purchasing department is indicated by the fact that all wheat is left in the cars until a protein test has been made. In this way, the protein content of everything in stock is known. Milling value is directly related to the chemical analysis, and all flour sold is tested by baking tests and chemical analysis before going out.

FRENCH IRON INDUSTRY.

On January 1st the number of furnaces in blast in France was 116; this number decreased to 90 on February 1st, to 77 on March 1st, and to 74 on April 1st. This marked the climax of the crisis, and now, owing to the improvement of coke supplies, the iron and steel trade is slowly reviving.

H. M. LANCASTER
Appointed Director of Dominion Health Laboratories

The appointment of H. M. Lancaster, Director of the Laboratories of the Department of Health for Ontario, to the position of Director of the Laboratories of the Dominion Department of Health, as successor to Dr. A. McGill, was well received by all who knew anything of his work. In fact, the Dominion Government and Mr. Lancaster are both to be congratulated. The country has put the right chemist in the right place, and at a salary which indicates that the Government intends seriously to compete with industry when chemical executive ability is required.

Photo by Freelands, Toronto.
H. M. LANCASTER

Mr. Lancaster graduated from the Department of Chemical Engineering, Faculty of Applied Science, University of Toronto, in 1906. For some four years he acted as assistant to the late Dr. Hodgson Ellis. In 1910 he became Provincial Chemist. The Ontario Government was just then planning to broaden out its public health work. During the last thirteen years this work has grown until the province now has a central laboratory and several branches. Chemists and medical men are employed, as well as specialists in bacteriology. The practical value of the work quickly brought about rapid growth. Manufacturing operations were undertaken and carried through, in one particular instance involving a very considerable amount of research work. Mr. Lancaster has been a leader in all this, and much more. The University claimed his services in the three Departments of Medicine, Applied Science and Dentistry. In these departments together, he carried as much work as is usually undertaken by the average professor. He directed entirely the chemical departments of the Dental College. Thus the University suffers a considerable

loss by his appointment to Ottawa. He is qualified as a chemist, sanitary engineer, bacteriologist, research worker and business executive for his new duties. Following a brilliant course at the University, his capacity for sustained work has really been most remarkable.

He will undertake his new duties with the very best wishes of the profession in Toronto, where his work and his fine personality have created for him a host of friends among chemists, engineers and the medical fraternity.

In Chemical Society work Ottawa will gain a strong supporter, as Mr. Lancaster was chairman of the Toronto and Western Ontario Section of the Canadian Institute of Chemistry and an active member of the Society of Chemical Industry.

RECOMMENDATIONS OF MONTREAL SECTION, S. C. I. COMMITTEE RE PATENT LEGISLATION.

The special committee appointed by the Montreal Section, Society of Chemical Industry, to report on the proposed amendments to the Patent Act, made the following report, the recommendations contained therein being forwarded to the Government, and are, we undersand, being seriously considered by the Government before any final action:

Your committee appointed to examine into the patent legislation now before the House of Commons as Bill 20 reports as follows:

The Bill has been carefully compared with the existing Patent Act and it is found that many improvements have been introduced. The more important of these concern the filing of applications and the conditions for keeping patents in force.

The new regulations for filing applications will bring the Canadian law into conformity with the laws of other countries and make it possible for Canada to join the International Convention with the advantage that Canadian inventors may file applications in foreign countries after filing in Canada and obtain the Canadian filing date in the foreign countries. The privilege is reciprocal as to foreign inventors obtaining Canadian patents.

The existing regulations for keeping patents in force are very difficult to comply with and the chances of an inventor losing his patent are great. The Bill substitutes entirely different conditions which give the inventor a much better chance and at the same time give good protection to the public and the manufacturing industries of Canada. In short, the inventor must supply the public with his invention or allow the public to use it at a reasonable price.

Your committee is of the opinion that the passage of this Bill should be supported by all possible means, but that at the same time recommendation should be made for amendment in three respects, namely:

1. Examination of patent applications.
2. Patenting of chemical products.
3. Conflicting patent applications.

which will be dealt with in the order named.

1. Examination.

One of the principal requisites for obtaining a valid patent (Section 7 of Bill 20) is that the invention covered by the patent shall not have been described in any printed publication in Canada or any foreign country before the inventor's conception thereof or more than two years before the application is filed in Canada. Assurance that a Patent application complies with the law in this respect can be obtained only by careful examination of the patents and technical literature of the whole world. Such an examination is beyond the means of the individual inventor. There is in the Patent Office much material and a trained staff of examiners for making such examination.

The existing Patent Act in Section 15 makes this examination by the Patent Office compulsory, but, nevertheless, the full facilities of the Patent Office have not been utilized for some time past. Bill 20 contains no Section making examination compulsory.

It has been officially stated that there is no intention of discontinuing examination and that provision for same will be made by Order in Council. In view of the fact that those most interested in this vital point, the inventors, manufacturers and general public, will have no say in the framing of such Orders in Council and in view of the fact that Orders in Council may be easily altered or rescinded without notice to the public, your committee deems it expedient that search in the Patent Office be placed on the more permanent statutory basis and that a section be inserted in Bill 20 to make compulsory an examination by the Patent Office to the full extent of available resources.

A thorough examination in the Patent Office is essential to prevent, as far as possible, public and individual rights being trespassed upon and to avoid the expense of resulting litigation. The search is also necessary to give weight and authority to such patents as are granted. The patents of those countries which have most rigid Patent Office examination are most highly esteemed, and the tendency is to more rigid examination.

In Canada, a thorough examination is now more than ever necessary because Section 8 of Bill 20 materially shortens the time within which patent applications may be filed and thus makes it practically impossible to obtain the benefit of Patent Office search in some other country before filing in Canada.

2. Chemical Patents.

Section 16 of Bill 20 in effect prevents the patenting of "substances prepared or produced by chemical processes" and limits the inventor to patenting the process. This seems to be an unfair discrimination between inventors of chemical products and inventors of mechanical products. This Section is apparently intended to relate to food or drug products, but the wording is such as to include all chemical products. The second paragraph of the Section gives special rights to the public in respect of food or drug products. Section 40 of Bill 20 contains compulsory license provisions which make it practically impossible for the patentee of a product to block the development of industry or the use of other processes for the production of the patented substance.

Your committee considers that paragraph (1) of Section 16 could be cut out altogether without appreciable detriment to the public, but that if this paragraph is retained it should be amended in line 2 to limit its application to food and drug products. Such an amendment would be the substitution of the words which are for the second word "or" in line 2 of the paragraph.

3. Conflicting Applications.

When two persons make application for patent for the same invention the practice has been to submit the matter to arbitration. Some time ago alternative provision was made for the settlement of such cases in the Exchequer Court. Bill 20 (Section 21) now proposes to

confine such cases to the Exchequer Court. In other countries, notably the United States, these conflicts are settled in the Patent Office.

The proposal to settle these conflicts in the Exchequer Court is very objectionable on a number of grounds. First, an inventor who cannot afford it may be thrust into an expensive and prolonged action which he cannot avoid except by abandoning his invention. Second, the main issue which is the right to a patent may be obscured by details of Court procedure and it may even be that the real inventor will lose on a point of practice. Third, very few patent attorneys are members of the Bar in any province and by transferring the cases to the Exchequer Court inventors will be deprived of representation by their patent attorneys, who cannot appear, and must hand over the cases to lawyers unfamiliar with the inventions. This may easily result in loss of rights and will certainly result in increased expense. Fourth, the losing party must always face the possibility of being compelled to pay the winning party's costs.

These four objections apply equally to the present optional system and the proposed system. A system such as is used in the United States has been considered and it is thought to be too complicated. The United States system contains some features which, if added to the present arbitration system, would yield what appears to be a simple and workable system which would not be too costly. These features are the clear setting forth of the conflict by identical patentable claims in both applications and the avoiding of fraud by preliminary statements of invention by both parties, back of which the parties cannot afterwards go.

Your Committee recommends:

1. That the examination of patent applications be not controlled by Order in Council, but that provision be made by law for an examination as thorough as possible utilizing every resource of the Patent Office, by having inserted in Bill 20, a Section as follows:

"On each application for a patent, the Commissioner shall cause a careful examination to be made by competent Examiners to be employed for the purpose, to determine if the invention involves the novelty and usefulness essential to the grant of a patent, and if the application otherwise conforms with the provisions of this Act, and each applicant shall be notified of any Canadian or foreign patent or printed publication or public use within the knowledge of an Examiner, which in the opinion of the Examiner anticipates in whole or in part the invention sought to be patented and there shall be particularly pointed out to each applicant the things or combinations in his application claimed as new which the Examiner deems to be anticipated, and when it is not obvious in what manner or respect the things or combinations would be anticipated the same shall be pointed out to the applicant."

2. That paragraph (1) of Section 16 of Bill 20 be struck out or at least amended in line 2 thereof by cancelling the second word "or" and substituting which are.

3. That Section 21 of Bill 20 be struck out and replaced by the Section 20 of the existing Patent Act with the following additions:

Paragraph (1) add—"unless the case is submitted to the Exchequer Court for review."

Add:—

"7. Before the arbitration, as aforesaid, commences the nature of the conflict shall be clearly pointed out to the applicants and each of them shall be required, within a time fixed by the Commissioner, to file in the Patent Office a preliminary statement under oath setting forth the earliest date on which such applicant conceived the invention involved in the conflict and such other facts as the Commissioner may require. Any applicant who fails to file such statement when required shall be deemed to have conceived the invention only on the date of his application for patent in Canada.

"8. Any applicant for a patent who believes himself entitled to patent for the whole or any part of an invention described or claimed in any Canadian patent dated not more than two years prior to the date of application of such applicant, may insert in his application the claim or claims of the patent to which he believes himself entitled and the Commissioner, if he is satisfied that the same exists, shall declare a conflict between such application and patent and the matter shall thereafter be conducted like as a conflict between applications.

"9. Anything in the Exchequer Court Act and amendments thereof, or in any other Act to the contrary notwithstanding, every conflict between applications or between an application and a patent, shall first be submitted to arbitration as in this Section provided.

"10. Any applicant or patentee to whom an adverse decision is rendered by the arbitrators shall have the right, within sixty days, to submit such decision for review to the Exchequer Court and the Exchequer Court shall review the evidence considered by the arbitrators and shall affirm or reverse the decision of the arbitrators or shall refer the matter back to the arbitrators for consideration of any recommendation which the Court may make or of any fresh evidence which, in the opinion of the Court, may properly be introduced."

DRAFT PROGRAMME OF CHEMISTS' CONVENTION.

Mining Building, University of Toronto,
May 29th, 30th and 31st.

TUESDAY, May 29th—

9-10 a.m.—Registration.
10 a.m.—Annual Meeting, and Presentation of Papers, Society of Chemical Industry.
1 p.m.—Luncheon at University.
2.30-5.30 p.m.—Presentation of Papers (continued).
8 p.m.—Illustrated address—Descriptive of some leading Chemical and Metallurgical Industries, by Dr. A. W. G. Wilson.

WEDNESDAY, May 30th—

10 a.m.—Annual Meeting, Canadian Institute of Chemistry.
1 p.m.—Luncheon.
2.30 p.m.—Canadian Institute of Chemistry.
7 p.m.—Annual Dinner, S.C.I., and Canadian Institute of Chemistry, to be held at Hart House.

THURSDAY, May 31st—

Visit to points of interest in St. Catharines, Thorold and Merritton districts.

On May 29th and 30th, exhibits of a number of companies, showing laboratory equipment, special machinery and chemicals will be on display at the Mining Bldg., University of Toronto.

Review of Our Chemical and Allied Industries

Present Conditions Outlined and Prospects Portrayed by Leaders and Experts in the Various Fields

THE GENERAL CHEMICAL SITUATION.

By V. G. Bartram, Sales Manager, Canadian Electro Products Co., Ltd.

I HAVE your request in reference to your Annual Review Number, and must compliment you on your foresight in arranging this Annual Number in conjunction with the Convention of Canadian Chemists.

In answer to your inquiry with reference to general industrial situation, as far as the Chemical Industry is concerned, would advise that, while the Chemical Industry in Canada perhaps suffered to a greater extent during the past period of depression than most other industries, to-day, in spite of many handicaps, the general feeling seems to be one of optimism.

The German competition, which was held as a "bogey" over the world's Chemical Trade, has almost disappeared, and no doubt the present situation in the Ruhr will further complicate matters for the German producers and reflect to the benefit of those other countries and to the Canadian industries, which have in spite of obstacles and discouragement held on during the trying times we have passed through.

In several lines to-day Canada is dominating the English market in spite of the threatened Continental competition, and if we can only get proper co-operation from the shipping interests there is no doubt but what full advantage can be taken of the present situation and hold obtained on the British market, which will make it increasingly difficult for the foreigner to overcome when he is once again in a position to be considered as a serious competitor.

Everything should be done to foster the spirit of Inter-Empire Trade which is at present abroad within the British colonies, especially in view of the existing United States tariff; and the policy of the present Canadian Government in fostering direct trade with the Mother Country through granting additional Preferential Duty is to be highly recommended.

Canada has much to be proud of in the development of her Chemical Industry, but it is going to take a strong fight to hold the place we have now obtained and by building on a firm foundation so that the industry will become a permanent Canadian asset. Only the closest co-operation of all interested can assure this, and the sooner this is realized the better it will be for all concerned.

THE ALKALI INDUSTRY.

By George M. Duck.
General Manager, The Canadian Salt Co., Ltd.

THE chemical industries of the Dominion of Canada, covering as they do so extensive a field, and having such a wide variation in products, must naturally be affected differently under present conditions. On the whole, there is an improvement in the demand for the products of the alkali industry of this country. Prices, however, are low, too low in view of the rapidly increasing prices of raw materials. Wages are on the increase, in fact everything points to higher operating costs.

The market for Liquid Chlorine in Canada is growing rapidly. In October last year this company put into operation a plant with a capacity of 10 tons per day, which at that time seemed ample to take care of the Canadian market. We have since increased the plant, and within the next month we expect to be producing at the rate of 20 tons per day.

The outlook for business generally seems to be fairly promising. Not only is there an improvement in the domestic market, but there is also increased inquiries for export business. The improvement that all industry is looking for at the present time must of necessity be gradual to be permanent, and it behooves every one connected with the industry to guard against the danger of inflation.

COBALT, SILVER, AND ARSENIC.

By F. A. Bapty, Sec.-Treas. Deloro Smelting & Refining Co.

THE Deloro Smelting & Refining Co., Ltd., treat exclusively ore, concentrates and residues produced in the Cobalt silver camp. The products therefrom, silver, arsenic, and cobalt, are practically all exported from Canada, so that the welfare of this company depends to a large extent on market conditions in other parts of the world.

Silver, of course, is always saleable, and the price ruling throughout the past year has been fairly satisfactory compared with the average of many years past.

Arsenic came into considerable demand the latter part of 1922 and the early part of this year, due to the large market for calcium arsenate in the Southern cotton fields. The price of arsenic practically doubled from what it was a year ago. The bulk of the arsenic produced by this company is used in the United States, but considerable quantities are now being consumed in Eastern Canada as insecticides, and in Western Canada for grasshopper bait purposes. The price of this article is influenced by the United States' requirements.

While this demand has encouraged producers in all parts of the world to turn out the maximum quantity possible, it would appear that the use of Calcium Arsenate and other insecticides is growing, and there is no practical reason in sight why the price of arsenic should be materially reduced from its present limits.

Cobalt Oxide. The ceramic industry in the United States during the past year has been in a very healthy state so that the market for Cobalt Oxide in that country has been particularly good.

Cobalt Salts, which up to the present have chiefly been manufactured from cobalt oxide, are growing in favor, particularly in the United States, and constantly increasing quantities of salts are being consumed in various manufacturing lines in the United States. Demand for cobalt oxide in the East, where considerable quantities of this chemical are used in the pottery and chinaware industry, is also good. While conditions in Europe are still more or less unsettled, the market for cobalt products is showing a healthy growth.

Cobalt Metal and Stellite. The revival of trade in the United States, particularly in the automotive industry, has caused a good demand for cobalt metal and stellite. This latter alloy is replacing high-speed steel to a very large extent in the automobile factories as well as in electrical shops, railway shops and other industries where production is of vital importance.

Taking everything into consideration, the Deloro enterprise is in a very healthy condition, and the future is looked forward to with considerable optimism.

THE PULP AND PAPER INDUSTRY.

By J. N. Stephenson,
Editor Pulp and Paper Magazine.

I HAVE your letter of the 19th, and appreciate very much your invitation to contribute a word to your Annual Review Number.

There seem to be three principal phases to the Pulp and Paper Industry in Canada: Paper, Pulp, and Pulpwood. In each case we have to consider the present and the probable future condition of the market, as well as the present and prospective production. The United States is by far our largest customer for newsprint paper and wood pulp, and our only customer for pulpwood. While some newsprint goes to other countries, our principal exports to countries other than the United States comprise book, writing and wrapping papers, consigned principally to Australia, New Zealand, Japan, South Africa and Great Britain. About 80 per cent. of our wood pulp exports for the fiscal year ending March, 1923, went to the United States, about half of the balance went to Great Britain, and the rest to other countries.

Newsprint paper is, and will continue to be, our principal item of export. Its value among the exports of the past twelve months represented more than 50 per cent. of the total value, while for the month of March, with the record shipment of 113,450 tons, the proportion was nearly 60 per cent. Most of this went to the United States. The erection of new complete units and the extension of older mills so as to manufacture their former excess production of pulp into paper indicates a growing belief in and appreciation of the value and wisdom of exporting our products in the finished condition. To do so means the more efficient employment of our water powers, capital investment and population, besides greatly improving our economic position relative to other countries; and this point is emphasized by the fact that during the year 1922-23 the tonnage of paper exported was only 25 per cent. greater than the tonnage of pulp exported, yet the value of the exports of paper was about 90 per cent. greater than the value of the exports of pulp. The relative change in value in passing from pulpwood to wood pulp is even greater than in passing from wood pulp to paper.

The growing appreciation of this last fact, together with the growing conviction that Canada does not possess unlimited supplies of timber, although the Dominion is, fortunately, blessed with large quantities, leads us to assume that there is likelihood of further restrictions on the export of unmanufactured wood from Canada. The Canadian mills undoubtedly need every stick of pulpwood that is growing at the present time, and there is some question as to whether there is enough pulpwood growing now to keep the mills running until such time as belated efforts at reproduction of the forest shall have become effective.

The outlook for this indusrty, as for others, is very largely dependent upon the relative supply and demand. At the present time there is a very close balance. Mills are runnnig practically at capacity, and general business conditions are such that the volume of advertising, both in newspapers and in periodicals warrants a consumption that absorbs the current supply. This situation, of course, puts the paper industry in a very firm statistical position, and the leaders in the industry are exerting themselves in every way to maintain these stable conditions. They are resisting the temptation to increase prices, merely on the strength of the market, and on the other hand, are endeavoring to give the working man the maximum possible return for his labors, without so increasing cost of production as to require a new adjustment of prices; but there are indications that manufacturers will be forced to revise prices this summer. The aim is to furnish the consumer with the goods he requires at such a price as will enable him to buy all that the mill can produce. This, of course, makes for the fullest degree of employment both by the producer of paper and by the consumer of it, and the public benefits by the distribution of the earnings of both parties.

Consumption of printing papers for newspapers and magazines and books has been consistently increasing for some time, and has now reached a record level. This consumption, however, very quickly reflects, and is affected by general business conditions; this may be noticed in the fluctuation of as much as 32 pages in some papers from week to week, and. of from 2 to 8 or more pages in daily newspapers, and even more in the Sunday editions.

There has been a distinct migration of the newsprint industry to Canada, with the result that the current production is at the rate of about a million and a quarter tons of newsprint per annum. This will be increased largely during the current year by new machines which are now being installed or under construction, so that by this time next year we shall doubtless see the production of newsprint in Canada exceeding that in the United States, and therefore putting Canada in the position of the world's leader in the production of this most important commodity.

There is also an evident tendency to increase the production of other grades of printing paper, and when the time comes for a further restriction on the export of unmanufactured wood, in fact even without such a move, we are likely to see in Canada the establishment of mills making the finer grades of book papers and involving the production of soda pulp from our large resources in poplar and other suitable wood. This tendency will be affected by any revisions of the U. S. tariff.

The burning question remains, as it has for some time, as to whether the markets will accept all available and prospective production, and whether, in view of forest fires and other destructive agencies, there will be sufficient timber to maintain established and projected mills at maximum capacity. In view of these questions, the leaders of the industry are proceeding cautiously, thankful for the current prosperity in the industry, and trusting that the future will bring no serious setback.

THE CHEMICAL DISTRIBUTORS' OUTLOOK.

By T. E. O'Reilly,
President T. E. O'Reilly, Limited.

WE seem at the present time to be reaping the benefit of the increase in business which is spreading over the United States. There is a marked improvement in our business the last few weeks over the early part of the year.

With our wide range of lines we are able to cater to the Rubber Companies, Drug Houses, Packing Houses, Textile Mills, Soap and Oil Companies, etc., and at the present time we are doing a fair amount of business with all of these industries.

In our opinion prices will be better from now on than they have been for some time past, one of the principal reasons being that the majority of buyers ahve found that there is an honest effort being made by all manufacturers to quote the lowest possible prices, considering quality of the goods offered.

We experienced a great deal of competition from German imported materials for a time earlier in the year, which seemed to flood this market, perhaps due to the protective tariff which the United States had against these foreign goods, and the only available market was in Canada. There seems, however, to be a steadier tone now to this competition, and we believe that in the majority of cases the offerings were made simply as an effort to force sales.

THE OIL INDUSTRY IN CANADA.

By S. R. Parsons, President,
The British American Oil Company, Limited.

IN complying with your request to set forth some particulars about the present conditions of the oil industry of Canada, I take it for granted that you would like to pass on to your readers some information concerning crude petroleum as well as finished products of same, as they are handled and sold in the Canadian market.

To commence with, it may be of interest to state that the total amount of crude petroleum produced in Canada at the present time is very limited. It nearly all is brought to the surface from rather shallow wells in South-western Ontario. The total amount so produced, however, would not be sufficient to keep the Canadian refineries going for a week in a year. In New Brunswick there is a great deal of shale, which carries petroleum, and which, no doubt, will be made available when there is more or less of a shortage of the liquid crude. The period when the shale may be profitably crushed and the oil extracted is probably a generation distant. It is a gratifying fact, however, to know that not only at several points in Canada, but also in a number of the States of the Union, there are tremendous mountains of shale that will be profitably exploited and refined. Petroleum-bearing shale has been used in Scotland for a good many years.

In the Provinces of Saskatchewan and Alberta there are geological formations which would indicate the presence of large bodies of crude petroleum. This is particularly true in the district far north of Alberta's northern boundary. The later developments in this territory have not so far equalled the expectations and promises held out a couple of years ago. However, this is often the experience in new districts where they have been looking for oil, so that much may yet be expected from these northern regions. Already bitumen sands exist there to an enormous extent; the difficulty so far has, however, been to find a process for the extraction of the oil at a reasonable cost. In the southern part of the territory east of the Rocky Mountains and quite close to the international boundary line very important developments are now in progress. Crude petroleum has been obtained at several points, and it is hoped that with further development this may be found in very large volume. It certainly would help to enrich Canada very materially if crude oil is found, especially within reasonable distance of the demand for same. Notwithstanding the old darkey's assertion that the Lord put crude oil in the earth so that he could burn up the world very readily and effectually at the Last Day, the quest goes on for this important product used in increasing quantities in our modern civilized life. As it is now, the refiners of Canada are compelled to bring their crude oil from the mid-continent fields. Although much labor and expense are involved in the transfer, yet the refineries give employment to a good many thousand men in one capacity and another, all adding to the value and variety of our national industrial life.

The winter—which we have been so happy to say goodbye to at last—has not contributed to the sale of gasolene, oils, and other motor supplies to the extent that has characterized former recent winters. The deep snow and consequent impossible conditions of the roadways throughout the country and even in cities and towns, has meant that many car owners put up their cars for the winter season. Like some of the fur-bearing animals, they are only now coming out to view the prospects and prepare for more active existence. The view generally held, however, is that there will be a very large number of new cars placed upon the market this spring, and the demand for supplies of oil and gasolene will be larger than ever.

In view of the market price of crude oil, the figure at which gasolene is sold in Canada is not equal to what it should be. As compared with the present prices in Buffalo, size of gallon and quality considered (being quite inferior to the straight-run gasolene actually produced by the refining companies of Canada) the retail selling price of gasolene at present is considerably lower in Toronto. There seem to be a lot of people who have an idea that gasolene is largely made out of water or some substance that costs the refiners next to nothing, so that the profit on gasolene is therefore abnormal. As a matter of fact, it is of great interest to recall the statements made by one of the largest and oldest refining companies in the entire United States a few days ago in an advertisement scattered far and wide. They give figures to show that their total net profit on gasolene covering a series of years was less than one cent per gallon. It is only the large volume of business that makes a margin of profit possible.

It is perhaps not always appreciated that the refiners of Canada have erected many hundreds of storage-distributing stations all over Canada where their products reach the retailers and consumers with the least possible cost of freight and handling. Petroleum supplies are stored and sold by the refiners in every city and town and almost all the villages of the Dominion, thus making readily accessible these products to all users. The farm tractors, which are now scattered over the country, but principally used in the Prairie Provinces, are also large users of gasolene, as well as kerosene and oil supplies.

The immediate future of the lubricating oil business, especially in industrial plants, is more promising than for a couple of years past. Generally speaking, manufacturers are finding conditions improved, and this is reflected immediately in their necessary requirements of lubricants. The outlook for the season in all lines of the oil business is decidedly hopeful.

PHARMACEUTICAL AND DRUG TRADE.

By T. H. Wardleworrh, National Drug and Chemical Co., Limited

I do not know what I can say with regard to the position of general industrial conditions in the pharmaceutical trade as of course the recovery from the recent depression is very slow. There is the fact, however, that in some directions there is a marked upward trend, and notwithstanding the inactivity in this section of the industry, some manufacturers have commenced to produce new products and from the signs given they are evidently establishing themselves in the lines that they have chosen. It is true the volume of business is small in most cases, but the manufacturers seem to be able to hold their own.

DYEING CELLULOSE ACETATE.

La Societe Chimique du Rhone, 21 Rue Goujon, Paris, has patented a process by which cellulose acetate silk, films, etc., are rendered amenable to dyeing by treatment with a hot or cold relatively concentrated solution of a neutral alkali metal salt, to which has been added, in the place of the alkali of the process of the parent specification, a salt having an alkaline reaction and adapted to affect the saponification of the acetate, in an amount less than the equivalent of a one per cent. solution. In an example, the bath contains sodium sulphate and sodium carbonate and is heated gradually to 85 degrees C.

Canada's Chemical Trade

A Review and Survey of Trade Conditions and Statistics in Leading Chemical Industries. Specially Prepared for this Paper to Include Latest Data Possible.

By S. J. COOK,
Chief Mining, Metallurgical and Chemical Division, Dominion Bureau of Statistics, Ottawa.

WITH a production of chemicals and allied products valued at nearly $100,000,000, importations of similar products to the extent of $25,690,000, and exports of chemicals to other countries amounting to $12,484,000, Canada's chemical trade in 1922 indicated that satisfactory progress was being made in every field of this increasingly important industry. Chemical prices which in 1921 had declined about 17 per cent., mostly in the first quarter of the year, had become stabilized by the end of 1921 so that throughout 1922 there was little change in the quotations of most commodities. In this the situation in Canada did not reflect conditions in the United States where a considerable advance in chemical prices characterized the markets. Labour statistics showed that employment in a selected group of chemical industries in Canada increased in 1922 approximately 5 per cent. The value of the year's output of chemicals as reported by each of the ten groups for which the records are here given, was either maintained at about 1921 levels or increased so that on the whole these industries showed stability and conservative progress. Imports statistics reflected improved conditions in international trade, and the exports of Canadian chemicals and allied products showed a marked advance over the preceding year.

Production records in almost every industrial field during the past three years showed the effect of post-war influences. In 1919, as a result of the large scale production during the war years, the accumulation of stocks was considerably in excess of current requirements, with the result that production was much curtailed. Most of these stocks were disposed of in 1919 with the result that in the early part of 1920 an appreciable advance in prices occurred which reached a maximum about the middle of the year. This advance in prices was followed by increased production and in many industries, 1920 was a banner year. During the closing months, however, demands from consumers for lower prices became more insistent, and in 1921 a nation-wide reduction of inventories and deflation in prices occurred. At the close of that year, although prices were at a much lower level than at the beginning, conditions throughout the industry were much improved and the prospects for conservative and consistent progress were much better than at any time since the close of the war. Substantial progress was made in 1922, and 1923 opened with conditions distinctly favourable for a marked advance in production reports.

In certain well-defined fields, the production of chemicals in Canada has attained world-trade importance; in

NUMBER OF PLANTS AND VALUE OF PRODUCTS IN THE MANUFACTURE OF CHEMICALS AND ALLIED PRODUCTS IN 1921 AND 1922

Industry	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Alberta	British Columbia	Total for Canada 1921	Total for Canada 1922
COAL TAR AND ITS PRODUCTS—									
Number of Plants	1	..	3	5	..	..	..	9	..
Value of Products $	.....	.....	a 724,622	458,508	.....	.....	.....	1,183,130	1,100,000
ACIDS, ALKALIES, SALTS AND COMPRESSED GASES—									
Number of Plants	2	..	13	25	4	1	5	50	
Value of Products $	.....	.....	3,003,678	10,126,180	242,359	.....	296,603	b13,869,166	17,500,000
EXPLOSIVES, AMMUNITION, FIREWORKS, MATCHES—									
Number of Plants	..	..	7	12	..	..	3	22	
Value of Products	.....	.....	6,514,351	2,532,343	.....	.....	1,953,150	10,999,844	13,350,000
FERTILIZERS—									
Number of Plants	3	2	2	7	..	..	1	15	
Value of Products $	953,824	.....	.....	1,001,799	.....	.....	.....	2,677,735c	2,400,000
MEDICINAL AND PHARMACEUTICAL PREPARATIONS—									
Number of Plants	1	1	18	65	7	..	1	103	
Value of Products $	.....	.....	2,443,311	8,173,898	1,155,666	.....	.....	11,945,435d	11,450,000
PAINTS, PIGMENTS AND VARNISHES									
Number of Plants	1	..	13	23	4	..	8	49	
Value of Products $	.....	.....	9,629,696e	6,238,872	1,223,858	.....	951,899	18,044,325	23,960,000
SOAPS, WASHING COMPOUNDS AND TOILET PREPARATIONS—									
Number of Plants	.....	1	22	31	4	3	2	63	
Value of Products	.....	.....	2,789,323	9,765,531	925,693	413,570	.....	15,307,821f	15,570,000
INKS, DYES AND XOLORS—									
Number of Plants	.....	1	7	13	1	1	3	26	
Value of Products $	.....	.....	518,633	1,914,580	.....	.....	45,636	2,533,480g	2,780,000
WOOD DISTILLATES AND EXTRACTS									
Number of Plants	.....	.....	5	7	.....	.....	.....	12	
Value of Products $	.....	.....	1,362,951	839,363	.....	.....	.....	2,202,314	2,200,000
MISCELLANEOUS CHEMICAL INDUSTRIES—									
Number of Plants	3	5	35	62	2	1	2	110	
Value of Products $	33,625	100,720	1,704,182	6,530,440	.....	.....	.....	8,421,852h	9,260,000
TOTAL—									
Number of Plants	11	10	135	250	22	6	25	459	
Value of Products $	2,181,326	1,729,687	27,846,328	47,581,514	3,643,815	458,824	3,743,608	87,185,102	99,570,000

a. Includes production of 1 firm in Nova Scotia.
b. Includes production of 2 firms in Nova Scotia, 1 firm in Alberta.
c. Includes production of 2 firms in New Brunswick, 2 firms in Quebec, 1 firm in British Columbia.
d. Includes production of 1 firm in Nova Scotia, 1 firm in New Brunswick, 1 firm in British Columbia.
e. Includes production of 1 firm in Nova Scotia.
f. Includes production of 1 firm in New Brunswick, 2 firms in British Columbia.
g. Includes production of 1 firm in New Brunswick, 1 firm in Manitoba, 1 firm in Alberta.
h. Includes production of 2 firms in Manitoba, 1 firm in Alberta, 2 firms in British Columbia.

many other lines, production in competition with imported chemicals is being carried on successfully, and latterly, the manufacture of specific commodities for which there is a definite and continuous demand, has proved an attractive field for small concerns. Several plants have been established, each of which specializes in the production of one or more of these necessities for the chemical trade. A study of the imports statistics shows that many such opportunities exist, and if a detailed examination of the imports invoices could be made, and the results compiled in a comprehensive way, the production in Canada of many chemicals presently only available by importation from foreign sources, would be undertaken, with every prospect of success attending the ventures.

The chemical industry, however, is one in which the would-be producer often finds himself faced with competition of a kind that is very difficult to overcome. Established concerns who, for many years, have obtained their supplies of chemicals from a particular source, tend to be very conservative in their procedure, and, although the war, by cutting off the supply of some commodities, made it necessary for such firms to depart from their accustomed practice in many ways, the tendency to revert to former sources and methods, persists and in some lines, makes it almost impossible for a new industry to succeed.

Industries Covered in This Report.

In studying the production of chemicals and allied products in Canada it has been found convenient to arrange these industries in ten (10) groups, namely: coal tar and its products; acids, alkalies, salts and compressed gases; explosives, ammunition, fireworks and matches; fertilizers; medicinal and pharmaceutical preparations; pigments, paints and varnishes; soaps, perfumery, cosmetics and other toilet preparations; inks, dyes and color compounds; wood distillates and extracts; miscellaneous chemical industries.

Coal Tar Products.

The distillation of tar in Canada has been carried on as a separate industry by several plants for a number of years, and as an adjunct to the production of composition roofing by several other concerns. The products include creosote oils; naphthalene; pitch; benzine; naphtha; toluene; and road tars. At the time of writing no statistics for 1922 are available but in 1921 there were four (4) plants whose major product was refined tar and tar distillates, and the products made were valued in excess of $1,000,000. The manufacture of disinfectants composed principally of coal tar products, increased considerably in 1920 but the value of the output in 1921 was very much less. Seven (7) plants were included in this group and the value of their products, which in 1920 was above $217,000, was only $94,341 in 1921. The decrease in output value was due to the discontinuance of the manufacture in Canada, by certain firms in this industry, of paper towels and similar products. The output of disinfectants was slightly less than in 1920.

Heavy Chemicals and Compressed Gases.

The manufacture of heavy chemicals in Canada has been carried on for a great many years. The production of mineral acids was one of the earliest chemical industries to be established and it has always shown great stability and strength. During 1922, the products made by the firms under the grouping "Acids, alkalies, salts, and compressed gases," reached a total value of nearly $17,600,000, an increase of more than $4,000,000 over the value of the 1921 output. The production of sulphuric acid alone increased more than 20,000 tons to a total of 67,280 tons valued at $1,390,000. Calcium carbide, calcium and sodium cyanides, and soda ash were produced in increasingly large quantities during the year.

The manufacture of compressed gases, including oxygen, acetylene, carbon dioxide, anhydrous ammonia and hydrogen ,continued on about the same scale as in the two preceding years, the total production being valued at $2,000,000.

Explosives.

There was a considerable increase in the production of explosives during the year and the output of the nine (9) plants in this industry including intermediate products manufactured for further use by the firms reporting, amounted to nearly $8,000,000 in value. The production of ammunition including safety cartridges, detonators, electric detonators, primers, et cetera, was slightly less than in 1921 and was valued at $2,200,000 as compared with $2,285,000 in 1921.

Three (3) firms manufactured fireworks in Canada during the year.

In the manufacture of matches two new plants were put in operation during the year, one by the Canadian Match Co., of Pembroke, where formerly splints only had been manufactured, and the plant of The Match Company at Berthierville. Incomplete returns at the time of writing indicated that the production of matches in Canada in 1922 was considerably above the quantity made in 1921 when the value of matches and fireworks made amounted to $2,313,000.

Fertilizers.

The production of fertilizers in Canada was carried on by sixteen (16) plants and the value of the output in 1922 was estimated at $2,400,000. In addition to these plants there were, however, a number of other industries making products which could be used either alone or in admixture as fertilizers, and as a matter of fact the production of such materials by the industries classified in other groups was in excess of the quantities produced by the firms making fertilizers exclusively. Conditions in the fertilizer trade during the past few years have been rather difficult and the value of the output has consequently declined. On the other hand, imported fertilizer materials such as muriate and sulphate of potash and nitrate of soda, have become available in greater quantity and at a lower price. As a consequence of this, considerable quantities have been imported.

Pharmaceuticals.

The selling value of the products made in the medicinal and pharmaceutical preparations industry was slightly less than the value credited to the output of these concerns in 1921, but in general it may be said that the industry maintained its established position. The manufacture in Canada of a sufficient supply of medicinal and pharmaceutical preparations to meet domestic requirements and possibly to develop an export trade, is the goal of the industry and the fact that Canada still imports about $2,000,000 worth of these commodities each year, is evidence that there is yet much room for progress. Incomplete returns of 1922 production reports indicated that the value of the output in that year would be in the neighborhood of $11,450,000.

Pigments, Paints and Varnishes.

The manufacture of paints, pigments and varnishes continued to be Canada's leading chemical industry and in 1922 the output of the plants in this group was estimated to be worth $23,960,000, at which figure a gain of nearly $6,000,000 in output valuation was attained. The figures for 1922 did not come up to the values established for 1920 but they indicated that a very considerable advance had been made by the industry during the past year.

Soaps and Perfumery.

The manufacture of soaps, washing compounds and toilet preparations contributed products valued at $15,570,000, and at this figure the group ranked third among the chemical industries. Canada still imports more than $1,000,000 worth of soaps annually, mostly from the United States, nearly all of which comes under the headings, "common laundry soap," and "toilet soap." On the other hand, the exports of Canadian soap go princi-

IMPORTS INTO CANADA, AND EXPORTS OF CHEMICALS AND ALLIED PRODUCTS DURING THE CALENDAR YEARS, 1920, 1921 AND 1922

Commodity and Source	Imports			Exports		
	1920	1921	1922	1920	1921	1922
Acids—	$	$	$	$	$	$
United Kingdom	502,372	118,704	79,857	641,090	2,618	257,167
United States	535,976	259,481	364,142	376,509	67,346	45,166
Other Countries	32,677	72,996	108,072	465,942	12,456	18,158
Total	1,071,025	451,181	552,071	1,483,541	82,420	320,491
Alcohols, Industrial—						
United Kingdom	.....	141	16	169,103	131,852	77,625
United States	851,499	1,297,267	74,806	541,219	16	4,089
Other Countries	169,776	117,933	17,069	67,057	109,193	18,170
Total	1,021,275	1,415,341	91,891	777,379	241,061	99,884
Cellulose Products—						
United Kingdom	39,199	48,778	66,783	.....	.....	.....
United States	1,527,032	896,276	822,186	.....	.....	.....
Other Countries	5,634	12,105	67,215	.....	.....	.....
Total	1,571,865	957,159	956,184	.....	.....	.....
Drugs, Medicinal and Pharmaceutical Preparations—						
United Kingdom	1,411,223	768,170	904,427	640,808	231,327	217,276
United States	1,850,884	1,360,882	1,085,176	30,754	7,792	20,476
Other Countries	520,400	363,638	377,185	377,497	250,169	227,152
Total	3,782,507	2,492,690	2,366,788	1,049,059	489,288	464,904
Dyeing and Tanning Materials—						
United Kingdom	915,084	300,359	234,934	32,000	21,300	26,739
United States	5,301,854	2,500,134	2,843,458	202	14,577	5,110
Other Countries	660,130	957,157	977,559	3,624	1,631	3,938
Total	6,877,068	3,757,650	4,055,951	35,826	37,508	35,787
Explosives—						
United Kingdom	384,455	42,104	45,899	.....	.....	32
United States	463,986	187,599	219,826	542,378	253,380	84,442
Other Countries	15,672	38,208	197,776	748,979	33,632	216,494
Total	864,113	267,911	463,501	1,291,357	287,012	300,968
Fertilizers—						
United Kingdom	216,064	35,185	2,960	68,006	12,029	.....
United States	3,719,315	1,972,664	1,572,931	4,463,609	1,648,042	2,815,037
Other Countries	439,697	575,762	471,560	1,713,883	599,812	411,790
Total	4,375,076	2,583,611	2,047,451	6,245,498	2,259,883	3,226,827
Paints, Pigments and Varnishes——						
United Kingdom	530,087	395,533	635,151	1,137,829	199,575	201,900
United States	4,080,128	1,793,223	2,349,390	172,935	92,619	67,525
Other Countries	229,035	410,595	455,300	792,117	196,309	202,536
Total	4,839,250	2,599,351	3,439,841	2,102,881	488,503	471,961
Perfumery, Cosmetics and Toilet Preparations						
United Kingdom	107,075	64,229	75,533			
United States	499,781	441,015	488,252	Not separately itemized		
Other Countries	656,104	438,619	339,132			
Total	1,262,960	943,863	902,917			
Soap—						
United Kingdom	117,188	61,467	106,435	90,210	97,195	192,922
United States	1,510,508	1,084,470	930,727	2,123	3,908	1,494
Other Countries	70,849	83,789	102,708	240,094	69,126	81,374
Total	1,698,545	1,229,726	1,139,870	332,427	170,229	275,790
Inorganic Chemicals—						
United Kingdom	1,014,518	463,840	672,199	874,354	8,399	152,381
United States	6,353,024	4,241,687	5,124,361	4,079,939	4,440,145	3,746,184
Other Countries	298,222	246,128	423,475	834,216	649,761	2,284,781
Total	7,665,764	4,951,655	6,220,035	5,788,509	5,098,305	6,183,346
All other Drugs and Chemicals, etc., n.o.p.—						
United Kingdom	1,534,648	796,495	941,235	590,753	283,560	517,523
United States	3,799,228	2,374,942	2,285,624	2,226,099	663,939	415,716
Other Countries	256,767	192,543	225,693	443,610	225,830	170,809
Total	5,590,643	3,363,980	3,452,552	3,260,462	1,173,329	1,104,048
Recapitulation—Chemicals and Allied Products—						
United Kingdom	6,771,913	3,095,005	3,765,429	4,244,153	987,855	1,643,565
United States	30,493,215	18,409,640	18,160,879	12,435,767	7,191,764	7,205,239
Other Countries	3,354,963	3,509,473	3,762,744	5,687,019	2,147,919	3,635,202
TOTAL	40,620,091	25,014,118	25,689,052	22,366,939	10,327,538	12,484,006

pally to the United Kingdom. The total value of the export trade is in the neighborhood of $200,000. It is expected, however, that export trade in soaps will be developed very considerably and that the domestic requirements will also be more nearly met by the early further developments of this strong Canadian industry.

The manufacture of washing compounds in Canada is one of the industries in which decided progress has been made. Three (3) new plants were established in 1921. The ease of manufacture and the ready market for these useful preparations probably account for the increased prosperity.

While considerable quantities of perfumes, cosmetics, and toilet preparations are made as minor products of several other industries, the manufacture of these commodities as principal products has been carried on in Canada for a number of years, and the industry has become recognized as one of no mean importance.

Inks, Dyes and Color Compounds.

The manufacture of printing inks continued to be the principal item of production in the inks, dyes and colors group. The value of the group output in 1922 estimated at $2,200,000 was practically unchanged from the report for the previous year.

Wood Distillates.

The production of wood distillation products in 1922 continued on an even more modest scale than in the preceding year, which was one of the dullest in the history of the industry.

Miscellaneous Products.

The manufacture of chemicals and allied products which do not naturally fall in any of the groups previously considered and including such commodities as adhesives, artificial abrasives, boiler compounds, flavoring extracts and jelly powders, polishes and dressings, sweeping compounds, baking powders, insecticides, and chemical products not elsewhere specified, was carried on by about one hundred and ten (110) firms in Canada, and the value of their combined outputs in 1922 was estimated at $9,260,000. an increase of more than $1,000,000 over the totals for 1921.

Detailed reviews covering the production of chemicals and allied products mentioned in the preceding paragraphs, will be prepared shortly and will appear in a report on "Chemicals and Allied Products in Canada in 1922," published by the Dominion Burau of Statistics at Ottawa.

Imports.

The total importations of chemicals and allied products into Canada during the calendar year 1922 were valued at $25,689,000, an increase of $675,000 over the amount reported in the preceding year.

There was a very considerable increase in the quantities of sulphuric and muriatic acid imported into Canada during 1922 but the imports of nitric acid were slightly less than in the preceding year. Oxalic acid importations were less while the quantities of stearic acid, tannic acid, tartaric acid and boracic acid were greater than in 1921.

Industrial alcohols from foreign countries were an almost negligible quantity in 1922 although in previous years the importations under this item were quite large.

Under the heading, "Cellulose Products," nearly one million dollars worth of foreign goods was imported, consisting principally of celluloid, xylonite, and manufactures of celluloid.

An item under the "Drugs, medicinal and pharmaceutical preparations" group showed that four times as much nicotine sulphate was imported in 1922 as in the preceding year; the total value of the imports under this item amount to $36,690. Medicinal, chemical and pharmaceutical preparations, including proprietary preparations (dry) comprised products valued at nearly two million dollars. One-half of the importations under this item came from the United States.

More than four million dollars' worth of dyeing and tanning materials was imported during the year. Of this value, about one-half was for aniline and coal-tar dyes, mostly from the United States, with similar quantities from the United Kingdom, Germany, Netherlands and Switzerland. Oak bark and quebracho and similar extracts, not otherwise provided for in the Customs classification, amounted in value to more than one million dollars, and most of these materials were imported from the United States.

The importation of explosives amounting in value to $463,501, was nearly double the importation in the preceding year. The principal imports came under the headings "nitrate compounds; fireworks and fire crackers; gun, rifle, sporting, cannon, musket and cannister powder; giant powder, nitro, and other explosives."

In spite of the fact that Canada exported about 10,000 tons of ammonium sulphate during the year the imports records showed that over $20,000 worth of this commodity was imported from the United States during the same period.

Included under the heading "Fertilizers," there were potash salts (muriate and sulphate), and nitrate of soda amounting in value to more than one million dollars.

In the group, "Paints, pigments and varnishes," the principal import item was zinc white. Very considerable quantities of this commodity were used in the manufacture of enamel and mixed paints and larger quantities were used in the manufacture of rubber and oilcloth. The imports in 1922 were valued well above one million dollars and amounted to more than 10,000 tons.

A long list of inorganic chemicals is shown in the imports section in the Monthly Report on the Trade of Canada, and the quantities opposite the individual items for 1922 showed that several were brought into Canada in quantities amounting to more than one million pounds. The values for the individual items varied from quite small amounts up to more than $600,000 and an even casual study of this particular section brings out the fact that there are in Canada developed markets in many industrial chemical lines that are presently almost wholly dependent upon foreign producers for their requirements.

Exports.

Exports of chemicals and allied products made in Canada increased in value about two million dollars over the record for the preceding year, and although this total valuation was much below the total for 1920, it indicated a definite resumption of growth in Canada's foreign trade in these lines. More than six million dollars' worth of inorganic chemicals was exported during the year and of this amount $3,226,827 represented the value of fertilizers and fertilizer materials. In this sum there was included all the cyanamide and ammonium sulphate exported as well as manufactured fertilizers shipped out of Canada.

Detailed statistics showing the quantities and values of all commodities itemized in the Customs classification are

published monthly by the Dominion Bureau of Statistics and are available in the report entitled, "Monthly Report on the Trade of Canada." Data are given for the month of the current year, the corresponding month of the preceding year, and cumulatively for the fiscal year to date, with corresponding figures for similar periods of the two immediately preceding fiscal years. A small charge is made for this publication. In addition to the monthly report there is an annual report showing similar data for a period of five fiscal years; copies of the annual report of the Trade of Canada may be had free of charge on application to the Dominion Statistician at Ottawa.

Ottawa, May 7, 1923.

CENTRAL SCIENTIFIC COMPANY APPOINTS NEW CANADIAN REPRESENTATIVE.

Mr. James H. Wilson, formerly president and general manager of the Canadian Laboratory Supplies, Ltd., Toronto, has severed his connection with this company, and has taken over the representation in Canada of the Central Scientific Company, of Chicago.

MANUFACTURING PLANT AVAILABLE.

A desirable manufacturing property, consisting of stone building 124′ x 94′ and 32′ high, equipped with gallery, tanks, and considerable plant, formerly used for making dyes and colors. Situated at Trenton, Ontario. Private dock and siding. Ample land for expansion. Ice in storage for season. Cheap coal and water transportation. C. P. R. and C. N. R. connections. Fixed and low taxation. Cheap power. May be leased with option to purchase at very reasonable rates. A desirable plant in every way for manufacturing purposes, particularly colors, paints or chemicals. Apply EBEN JAMES, Trenton, Ont.

MARKETS.

Owing to the large amount of special material for this issue it has been necessary to omit some of our regular departments, including Industry and Trade items, patents, etc. We have also had to eliminate our usual monthly market review, but we would draw the attention of our readers to the new form in which the market quotations will appear commencing with this issue. The whole list has been completely revised and enlarged and, we believe, will serve as a practical guide to the Canadian market month by month. While the market is quiet at present, prices are holding firm, with few declines. The consuming industries continue to buy steadily.

CURRENT CANADIAN MARKET QUOTATIONS ON CHEMICALS, GUMS, OILS AND METALS.

GENERAL CHEMICALS

Acetone, pure, drums or over	lb.	— .27
Lesser amounts	lb.	— .34
ACID—		
Acetic, 28%, car. lots	100 lbs.	— 4.80
28%, 25 bbl. lots	100 lbs.	— 5.05
28%, 10 bbl. lots	100 lbs.	— 5.30
28%, 5 bbl. lots	100 lbs.	— 5.55
28%, 1 or 2 bbl. lots	100 lbs.	— 5.80
80%, carload lots	100 lbs.	—13.20
80%, 25 bbl. lots	100 lbs.	—15.20
80%, 15 bbl. lots	100 lbs.	—16.20
80%, 10 bbl. lots	100 lbs.	—16.75
80%, 5 bbl. lots	100 lbs.	—17.20
80%, 3 or 4 bbl. lots	100 lbs.	—18.20
80%, 1 or 2 bbl. lots	100 lbs.	—18.50
Glacial, bbls	lb.	— .12
Carboys	lb.	— .12½
Boric, crystals, bbls	lb.	— .13
Boric, powder, bbls	lb.	— .12½
Benzoic	lb.	.85 — .90
Citric, kegs	lb.	.45 — .55
Formic, 75%, carboys, 100 lbs	lb.	.20 — .22
Gallic, tech	lb.	.50 — .55
Gallic, B. P	lb.	1.25 — 1.50
Hydrochloric, 18°, carboys, 100 lbs	lb.	2.25 — 2.75
Hydrochloric, 60%	lb.	.22 — .25
Hydrochloric, 30%	lb.	.11 — .13
Lactic, 44%, tech., light, bbl.	lb.	—
Lactic, 22%, tech., light, bbl.	lb.	—
Muriatic, see acid hydrochloric.		
Nitric, 36°, carboys	100 lbs.	8.25 — 8.50
Oleic	lb.	— .26
Oxalic	lb.	.15 — .18
Pbosphoric, 85%	lb.	— .28
Pbosphoric, 50%	lb.	— .22
Pyrogallic, resublimed	lb.	2.00 — 2.10
Salicylic, tech., bbl	lb.	.47 — .48
Salicylic, B.P. bbl	lb.	.50 — .52
Sulphuric, 66°, carboys	100 lbs.	2.25 — 2.75
Sulphuric, 66°, tank cars, f.o.b. works	ton	23.75 —24.00
Stearic, double pressed	lb.	.22 — .24
Stearic, triple pressed	lb.	.25 — .27
Tannic, B.P	lb.	.70 — .80
Tannic, tech	lb.	.45 — .55
Tartaric, crystals, bbls	lb.	—
Tartaric, powder, bbls	lb.	—
ALCOHOL, absolute Ethyl, case of 1 doz. 1 lb. bottle		— 3.15
In steel drums of 10 gals. capacity	Imp. gal.	—23.00
Acetone, bbls. or over	gal.	— 1.15
Lesser amounts	gal.	— 1.45
Aldehyde Ammonia	lb.	— .75
Alum, Ammonia, lump or ground	100 lbs.	4.50 — 5.00
Aluminium Sulphate, lump bags	100 lbs.	2.25 — 2.50
Ground, bags	100 lbs.	2.50 — 2.75
Iron, free	100 lbs.	— 4.00
Ammonia, aqua, 26°, carboys	lb.	.13 — .14
Drums	lb.	— .09½
AMMONIUM, Carbonate	lb.	.12 — .15
Chloride	lb.	.10 — .13
Amyl Acetate, tech	gal.	— 4.00
Pure	lb.	— .80
Arsenic, white	lb.	.15 — .17
BARIUM, Sulphate, B.P	ton	—60.00
Chloride	lb.	.06 — .08
Nitrate	lb.	— .16
Peroxide	lb.	— .26
Blanc fixe, dry, bbl	lh.	—
Pulp, bbl	ton	—
Bleaching Powd., 35%, drums	lb.	2.50 — 3.00
Borax, crystals	lb.	.06½— .06¾
Bromine, tech	lb.	— .38
Benzaldehyde	lb.	1.35 — 1.60
CALCIUM ACID, Phosphate	lb.	— .07½
Carbide, ton lots, f.o.b. wks	ton	—95.00
Carbide, less than ton lots	ton	—100.00
Chloride, fused	ton	—31.00
Chloride, flake	ton	44.00 —48.00
CAUSTIC SODA, flake, drms.	100 lbs.	5.00 — 5.50
Ground, drums	100 lbs.	5.00 — 5.50
Solid, drums	100 lbs.	4.25 — 4.75
CARBON BISULPHIDE, drums	lb.	.12 — .13
Tetrachloride, drums	lb.	— .15
Cobalt Oxide, black	lb.	— 2.00
Grey	lb.	— 2.25
Copperas, crystals	lb.	.02 — .02½
Sugar	lb.	.02 — .02½
Copper Sulphate (blue vitriol)	lb.	.08 — .08½
Corrosive Sublimate (mercuric chloride)	lb.	1.15 — 1.20
Dextrine, potato	lb.	— .06
Corn	lb.	— .08½
ETHER, B.P. (conc.)	lb.	— .55
Sulphuric	lb.	.30 — .35
Ferric Chloride, crystals	lb.	.13 — .14
Solution	lb.	— .10
Formaldehyde, bbls. or over	lb.	— .19½
200-lb. kegs	lb.	— .24½
100-lb. kegs	lb.	— .25½
50-lb. kegs	lb.	— .26½
Fullers' Earth, powder	100 lbs.	2.00 — 2.50
Car lots, f.o.b. Toronto	ton	—30.00
Fusel Oil, special, refined	gal.	4.00 — 4.50
Glycerine, crude, drums	lb.	— .15
Crude, single tin of 56 lb.	lh.	— .17
C.P., single tin of 56 lbs.	lb.	— .29
C.P., two or more tins	lb.	— .27
C.P. drums, 500-1,000 lbs.	lb.	— .21
Pale straw, drums, 500-1,000 lbs	lb.	— .20
Pale straw, single tin 56 lb.	lb.	— .28
Pale Straw, 2 or more tins	lb.	— .26
Hexamethylene Tetramine	lb.	— .85
Hydrogen Peroxide	gal.	.70 — .75
Iron Oxide, red, casks	lb.	.13 — .20
LEAD, Acetate	lb.	.14 — .16
Nitrate	lb.	.14 — .15
Lime, grey	ton	—14.30
Grey, in car lots	ton	—11.70
Hydrated, in ton lots	ton	—20.00
Litharge	lb.	.09 — .10
Lithopone	lb.	— .07½
Magnesite, Calcined	ton	—30.00
Clinkered	ton	—35.00
Raw	ton	—10.00
MAGNESIUM, Carbonate, bbls.	lb.	.14 — .16
Sulphate, B.P	ton	60.00 —70.00
Technical, car lots	ton	45.00 —50.00
Methyl Hydrate (wood Alcohol), 95%, bbls. or over	gal.	— 1.15
95%, half-bbl. lots	gal.	— 1.25
95%, lesser amounts	gal.	— 1.30
97%, bbls	gal.	— 1.20
97%, half-bbl. lots	gal.	— 1.35
97%, lesser amounts	gal.	— 1.50
Nickel Salt, single, in bbl. lots	lb.	— .13½
Single, per cwt	lb.	— .15
Double, barrel lots	lb.	— .14
Double, per cwt	lb.	— .15½
Phosphorus, yellow	lb.	— .34
Potash Prussiate, yellow	lb.	.32 — .34
POTASSIUM, Bicarbonate	lb.	— .20
Bichromate	lb.	.17 — .18
Carbonate, calc. 80-85%	lb.	— .11
Chlorate	lb.	— .10
Citrate	lb.	.90 — 1.00
Hydroxide (caust. potash)	sticks	— .45
Hydroxide (caustic potash), small drums	lb.	.10 — .15
Hydroxide (caustic potash) large drums	lb.	.09 — .10
Nitrate, casks	lb.	.10 — .12
Permanganate, bulk	lb.	.19 — .20
Red Precipitate (mercuric ox.)	lb.	— 1.75
Silver Nitrate	lb.	— 9.00
Soda Ash, bags	cwt.	2.25 — 2.40
SODIUM, Acetate, ton lots or ov.	lb.	— .08
Lesser amounts	lb.	— .08½
Aluminium Phosphate	lb.	— .03½
Benzoate	lb.	.60 — .85
Bicarbonate, 100% pure	lb.	2.50 — 3.00
Bichromate, bbls	lb.	.10 — .13
Bisulphite, powder	lb.	.05¼— .06
Bisulphite, 35 Be	lb.	.03 — .03½
Bromide (foreign)	lb.	— .28
Cyanide, bulk, 98-99%, in cases	lb.	— .34
Fluoride, 95-98%	lb.	.15 — .16
Hyposulphite, kegs	100 lbs.	4.75 — 5.00
Barrels	cwt.	4.00 — 4.50
Iodide	lb.	— 4.90
Nitrate, refined	cwt.	6.75 — 7.00
Crude, 95%	cwt.	5.25 — 5.75
Nitrite	lb.	.12 — .15
Perborate, U.S.P	lb.	.35 — .40
Peroxide, f.o.b. New York	lb.	.30 — .35
Silicate, 42°, car lots	cwt.	— 1.35
Smaller lots	cwt.	— 1.55
Silicate, 40°, car lots	cwt.	— 1.25
smaller lots	cwt.	— 1.45
Sulphide, 60-62% fused	lb.	.08 — .09
Sulphate (Glauber's Salts), crystals, in bags	cwt.	1.80 — 2.00
Car lots	cwt.	1.65 — 1.70
Sulphite	lb.	— .05
Prussiate, yellow	lb.	.24 — .25
Sulphur, ground	100 lbs.	2.50 — 2.75
Roll	100 lbs.	4.25 — 4.75
Talc, No. 1 grade	ton	—30.00
No. 2 grade	ton	—25.00
No. 3 grade	ton	—23.00
Tin Chloride, crystals	lb.	.30 — .35
Tri-Sodium Phosphate	lb.	.07 — .07½
Ultramarine, blue	lb.	.10 — .29
White Precipitate (mercuric-Ammonium chloride)	lb.	— 1.85
Whiting (English)	ton	—30.00
(American)	ton	—28.09
ZINC, Sulphate, com	lb.	.05 — .05½
Dust	lb.	.13 — .14½
Oxide, lead free	lb.	.11 — .12
Stearerate	lb.	.30 — .35

PHARMACEUTICAL CHEMICALS

AMMONIA, Aqua, C.P	lb.	— .22
Iodide	lb.	— 6.25
Asperin, 100 lb. lots, bulk	lb.	.75 — .95
Caffeine, English	lb.	— 3.50
Calomel (mercurous chloride)	lb.	1.50 — 1.60
Camphor, Monobromate	lb.	— 3.00
Refined, slabs	lb.	— 1.28
Refined, Tab	lb.	— 1.32
Carbolic Acid, white crystals	lb.	.38 — .40
Chloroform	lb.	.45 — .55
Coumarin	lb.	3.00 — 3.50
Cream Tartar, 98%	lb.	.25 — .30

Ether, B.P.	lb.		.55
Iodine, crude	lb.	4.50 —	4.75
Resublimed	lb.	5.50 —	5.60
Lithium Carbonate	lb.	1.80 —	2.10
Potassium Bromide, crystals	lb.	.28 —	.34
Granular	lb.	.28 —	.34
Iodide	lb.	—	4.40
Phenacetin	lb.	1.75 —	2.00
Phenolphthalein	lb.	—	1.50
Quinine	oz.	.70 —	.75
Saccharin	lb.	1.75 —	2.25

SYNTHETICS

Benzyl, Acetate	lb.	—	1.75
Benzoate	lb.	—	1.75
Citral	lb.	—	4.50
Coumarine	lb.	—	3.50
Heliotropine	lb.	—	5.00
Linalyl Acetate	lb.	—13	.50
Metbyl Salicylate	lb.	—	.75
Musk, Xylol	lb.	—	3.00
Teyseniol	lb.	—	1.00

ESSENTIAL OILS

Anise	lb.	—	.80
Bay	lb.	—	3.00
Bergamot	lb.	—	4.50
Cajaput	lb.	—	1.25
Campbor, white	lb.	—	.50
Brown	lb.	—	.25
Cassia	lb.	—	2.00
Cedar Leaf	lb.	1.90 —	2.00
Cedar Wood	lb.	—	.50
Citronella, Ceylon	lb.	—	.60
Java	lb.	—	.85
Clove	lb.	—	2.25
Eucalyptus	lb.	—	.65
Geranium Bourbon	lb.	—	7.50
Lavender	lb.	—	5.00
Spike	lb.	—	1.25
Lemon	lb.	—	.75
Lemongrass	lb.	—	1.35
Lime, distilled	lb.	—	1.00
Orange Sweet, Sicilian	lb.	—	3.50
West Indian	lb.	—	3.00
Peppermint, American	lb.	—	3.50
Japanese	lb.	1.75 —	2.00
Redistilled, B.P.	lb.	4.00 —	4.25
Pathouli	lb.	—10	.00
Otto of Rose	lb.	—	6.50
Rosemary	lb.	—	.65
Sandalwood	lb.	—	7.50
Sassafras	lb.	—	1.75
Thyme	lb.	—	1.45

VEGETABLE OILS

Castor Oil, No. 3, bbl	lb.	—	
AA, bbl	lb.	—	
Cocoanut, Ceylon, bbl	lb.	—	
Cochin, bbl	lb.	—	
Corn Oil, bbls	lb.	—	.12
Tank cars	lb.	.10 —	.10½
Cottonseed Oil, crude, f.o.b. U. S. mills, tanks	lb.	.10 —	.10
Summer, yellow, bbl	lb.	.12 —	.12¼
Winter, yellow, bbl	lb.	.13 —	.13¼
Linseed Oil, 1 to 2 bbls., Raw, per gal. of 9 lbs		—	1.50
3 to 5 bbls., Raw, per gal. of 9 lbs		—	1.49
6 to 9 bbls., Raw, per gal. of 9 lbs		—	1.47
Linseed Oil, 3c per lb. higher than raw		—	
Monopole Oil	lb.	.07 —	.16
Olive Oil, foots	lb.	.12 —	.14

GUMS

Arabic, clear amber sorts	lb.	—	.22
Regular grain No. 4 and No. 5	lb.	—	.30
Regular grain No. 2	lb.	—	.31
White sorts	lb.	—	.35
Powdered, No. 1	lb.	—	.40
Powdered, No. 2	lb.	—	.39
Indian, No. 1A	lb.	—	.28
No. 1	lb.	—	.25
Tragacanth, No. 1, ribbon	lb.	—	3.00
No. 1, flake	lb.	—	2.00
Turkey	lb.	—	2.00

VARNISH RESINS

Congo, sorts	lb.	.10 —	.11
Hard amber	lb.	.11½ —	.18
White	lb.	.35 —	.45
Damar, Batavia	lb.	.35 —	.38
Singapore, No. 1	lb.	.39 —	.45
Singapore, No. 2	lb.	.20 —	.24
Singapore, No. 3	lb.	.09½ —	.12
East India, pale bold	lb.	.22 —	.25
Pale nubs	lb.	.15 —	.17
Pale chips	lb.	.07 —	.12
Black bold	lb.	.09 —	.12
Black nubs and chips	lb.	.05 —	.08
Kauri, XXXXX	lb.	1.60 —	
XXXX	lb.	1.25 —	
XXX	lb.	1.10 —	
XX	lb.	.90 —	
X	lb.	.80 —	
No. 1	lb.	.67 —	.70
No. 2	lb.	.45 —	.50
No. 3	lb.	.25 —	.30
B. X	lb.	.55 —	.65
B. 2	lb.	.30 —	.35
No. 1 chips	lb.	.22 —	.27
Brown chips	lb.	.15 —	.20
Dust	lb.	.10 —	.15
Manila, Bold XXXXX	lb.	.21 —	.23
Nubs, pale	lb.	.18 —	.22
Nubs, amber	lb.	.10 —	.18
Soluble A	lb.	.16 —	.18
Soluble chips	lb.	.10 —	.12
Pontianac Bold	lb.	.20 —	.30
Genuine nubs	lb.	.14 —	.17
Genuine chips	lb.	.10 —	.12

WAXES

Bayberry	lb.	.35 —	.38
Beeswax, white, pure	lb.	—	.38
African	lb.	—	.30
Brazilian	lb.	—	.34
Chilean	lb.	—	.35
Refined	lb.	—	.31
Candelilla	lb.	.40 —	.42
Carnauba, No. 1, bags	lb.	—	.50
No. 2, North Country	lb.	—	.32
No. 3, North Country	lb.	—	.22
No. 3, chalky	lb.	—	.21
Ceresin, white	lb.	—	.12½
Yellow	lb.	—	.12
Japan	lb.	.19 —	.20
Montan, crude	lb.	.06 —	.07
Ozokerite, crude, brown	lb.	.16 —	.17
Black, 158°—160°, M.P.	lb.	.18 —	.19
Paraffin, 128°—130°, M.P., 250 lb. lots	lb.	—	.06
118°—120°, M.P., 250 lb. lots	lb.	—	.05
Parowax, blocks, 100 lb. lots	lb.	—	.08¾

SHELLAC

T.N.	lb.	—	.85
Superfine Orange	lb.	—	.90
A. C. Garnet	lb.	—	.82
Bone Dry	lb.	—	.99

NAVAL STORES, FLOTATION OILS

Pine Tar Oil, crude	gal.	—	
Refined	gal.	—	
Double, ref.	gal.	—	
Rosin, G., 280 lb. bbl. lots	bbl.	—	8.25
W.W., 280 lb. bbl. lots	bbl.	—10	.50
Turpentine, 1 bbl. lots	Imp. gal.	—	2.30
2 to 4 bbl. lots	Imp. gal.	—	2.29
5 gallon lots	Imp. gal.	—	2.45

PETROLEUM OILS AND DISTILLATES

Mid-Continent Crude, 42 W. gal.	bbl.	—	1.85
Pennsylvania Crude, 42 W. gal.	bbl.	—	4.00
Coal Oil	gal.	—	.21
Fuel Oil, bbls	gal.	—	.11
Tank cars	gal.	—	.09
Gasoline, motor	gal.	—	.29
Service stations	gal.	—	.33
Gasoline, ligbting	gal.	—	.34
Naphtba	gal.	—	.28

COAL TAR PRODUCTS

Alpha—Naphtbylamin	lb.	—	.52
Benzol, 100%	Imp. gal.	—	.65
90%	Imp. gal.	—	.60
Carbolic Acid, crude, 30%	gal.	—	.40
Creosote Oil, crude	gal.	—	.40
Refined	gal.	—	.60
Coal Tar, crude	bbl.	—10	.25
Refined	bbl.	—11	.50
Coal Tar Pitch, bbls	cwt.	—	2.00
Cresol, U.S.P., f.o.b. N.Y.	lb.	.25 —	.27
Dep Oil, 25%, f.o.b. N.Y.	gal.	.25 —	.28
H. Acid, f.o.b N.Y.	lb.	—	.85
Phenol, drums	lb.	.60 —	.65
Pyridine, f.o.b. N.Y.	gal.	2.75 —	3.00
Resorcinol, tech, f.o.b. N.Y.	lb.	1.40 —	1.50
Pure, f.o.b. N.Y.	lb.	2.00 —	2.10
Naphthalin, flake	lb.	—	.09
Balls	lb.	—	.10
Solvent Naphtba, refined	gal.	—	.48
Toluol, pure	gal.	—	.54
Xylene, pure, f.o.b. N.Y.	gal.	.75 —	.85
Comm., drums, f.o.b. New York	gal.	—	.37

FERTILIZER MATERIALS

Acid Phosphate	ton	$28.00—30.00
Animal Tankage, per unit of ammonia		— 3.50
Per unit of bone pbosphate of lime		— .10
Nitrate of Sode	ton	65.00 —70.00
Muriate of Potash	ton	—40.00
Pure Ground Blood, per unit of ammonia		— 4.00
Steamed Bone Meal	ton	—30.00
Sulpbate of Ammonia	ton	68.00 —70.00

TANNING AND DYEING MATERIAL

Cbestnut Liquid Extract	lb.	.02½ —	.03½
Fustic Crystals	lb.	.26 —	.30
Ground Sumac	ton	65.00 —70.00	
Hematine Crystals	lb.	.18 —	.22
Hemlock Liquid Extract	lb.	.03½ —	.04
Liquid Sumac Extract	lb.	.08 —	.09
Logwood, Solid	lb.	.18 —	.22
Quebracho Liquid Extract	lb.	.03 —	.03½
Quercitron Liquid Extract	lb.	.07 —	.08

CRUDE RUBBER

The following quotations on Rubber are in American funds, New York delivery:—

Para, upriver fine	lb.	$ —	.28
Upriver, coarse	lb.	—	.23
Caucho ball	lb.	—	.25
Plantation, 1st latex crepe	lb.	—	.31
Ribbed smoked sbeets	lb.	.35½ —	.35¾
Brown crepe, thin, clean	lb.	—	.29
Amber crepe, No. 1	lb.	—	.29½

MISCELLANEOUS MATERIAL

Asbestos, crude, No. 1, f.o.b. Quebec	ton	—500	.00
Sbingle, f.o.b. Quebec	ton	70.00 —80	.00
Cement, f.o.b. Quebec	ton	21.00 —25	.00
Barytes, floated	ton	30.00 —35	.00
Crude, f.o.b. mines	ton	10.00 —11	.00
Casein, tech., bbls	lb.	.28 —	.30
China Clay, f.o.b. Huberdean, Que., car lots	ton	17.00 —18	.00
Imported	ton	20.00 —23	.00
Feldspar, No. 1, f.o.b. mill	ton	25.00 —27	.00
Fluorspar, ground	ton	25.00 —28	.00
Graphite, crude high grade	ton	35.00 —45	.00
Ceylon, lump	lb.	.06 —	.06½

INDUSTRIAL GASES

Acetylene, cylinders	100 cu. ft.	$2.55—	3.00
Coal Gas, cylinders	100 cu. ft.	3.00 —	4.00
Hydrogen, cylinders	100 cu. ft.	1.50 —	2.00
Nitrogen, cylinders	100 cu. ft.	2.00 —	3.00
Oxygen, cylinders	100 cu. ft.	1.50 —	2.00

METALS

Aluminium, 98-99%, 15 ton lots	lb.	—	.24
Antimony	lb.	—	.08¾
Brass, yellow ingots	lb.	—	.12
Red	lb.	—	.16½
Rods	lb.	—	.19
Cobalt	lb.	3.00 —	3.25
Copper electrolytic, small lots	cwt.	—18	.75
Car lots	cwt.	—18	.25
Casting, small lots	cwt.	—17	.75
Casting, car lots	cwt.	—17	.25
Gold, pure	oz.	23.00 —25	.00
Iron, pig	ton	—34	.00
Bar iron, base	cwt.	— 3	.75
Lead, pig, small lots	cwt.	— 7	.40
Car lots	cwt.	— 6	.90
Magnesium, ribbon	oz.	— 1	.50
Ribbon	lb.	—18	.00
Powder	oz.	.60 —	.65
Monel Metal, machined rods	lb.	—	.50
Blocks	lb.	—	.34
Shot	lb.	—	.34
Sheet, hot rolled, on orders of over 500 pounds, of one gauge	lb.	—	.48
rods, hot rolled	lb.	—	.42
Rods, cold rolled	lb.	—	.53
Nickel, shot or ingot	lb.	—	.35
Platinum, pure	oz.	—124	.00
5% iridium	oz.	—128	.00
10% iridium	oz.	—138	.00
Silver, bar, American silver	oz.	—	.99¼
Bar, Canadian produced, U.S. funds	oz.	—	.67½
Steel, mild, ¼-inch, base price	cwt.	— 3	.75
3/16-incb, base price	cwt.	— 4	.25
Black sheet, 28 gauge, size 30"	cwt.	— 5	.65
Black sheet, 28 gauge, size 36"	cwt.	— 5	.75
Sbeets, galvanized, 28 gauge, 30"	cwt.	— 6	.75
Blue sheets, base	cwt.	4.50 — 4	.60
Sheets, galvanized, 28 gauge, 36"	cwt.	— 7	.00
Tin	lb.	—	.51
Zinc, sheets	lb.	—	.13
Zinc, (spelter), small lots	cwt.	— 8	.95
Car lots	cwt.	— 8	.45

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Aggregate Value of $769,418,462

Production for Year Ending December, 1922, $35,158,843

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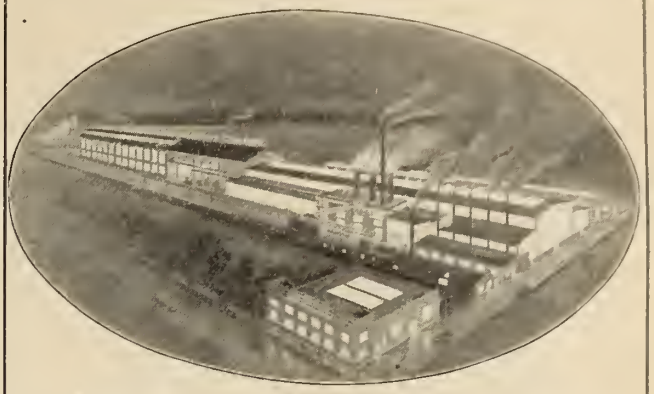

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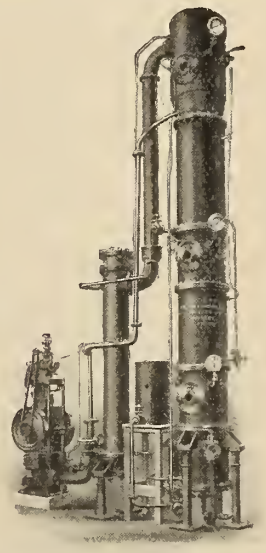

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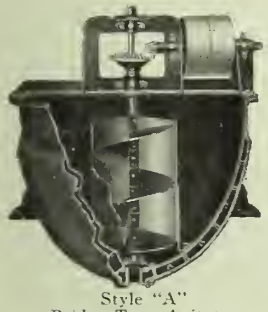
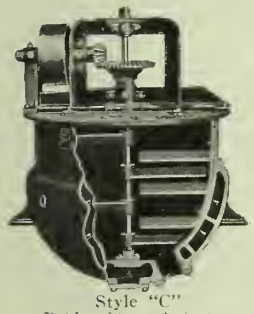
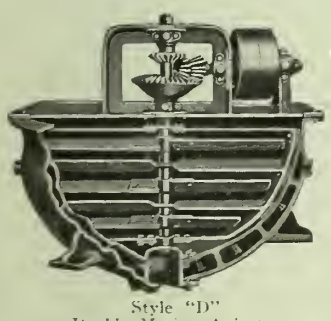
IF YOU NEED KETTLES



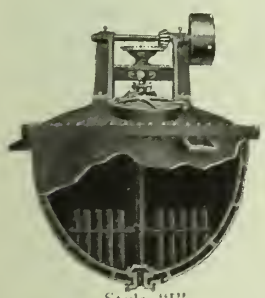
Style "A"
Bridge Type Agitator



Style "C"
Bridge Type Agitator



Style "D"
Double Motion Agitator



Style "I"
Agitator with Cover for
Pressure or Vacuum

Here are eight reasons why you should install Dopp S-e-a-m-l-e-s-s Kettles

1. **Cast in One Piece**—without rivets or bolts—no seams, joints or welds to work loose.
2. **Thin Shells**—which mean quick heating and cooling.
3. **Unusual Strength,** due to seamless-stay-bolted construction.
4. **Smooth Castings,** due to our special process.
5. **Special High Grade Iron**—extremely close grained and tough—tensile strength 35,000 to 40,000 pounds.
6. **Long Lasting** because of pure material and simplest possible construction.
7. **Absolutely Safe**—Every standard kettle tested at 150 lbs. hydrostatic pressure—special kettles built for higher pressures.
8. **Guaranteed for Life** against defects in workmanship and material.

DOPP Seamless Kettles are made in over sixty different sizes and shapes, from 1 to 1000 gallons capacity.

Many different styles of agitators.

Covers for pressure or vacuum.

Outlet Valves for handling any material.

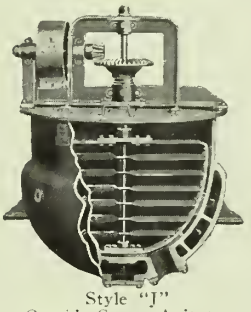
New Complete Catalog

Our new complete Catalog, No. 7, contains 64 pages of real information regarding Steam Jacketed, Oil Jacketed and Single Shell Apparatus.

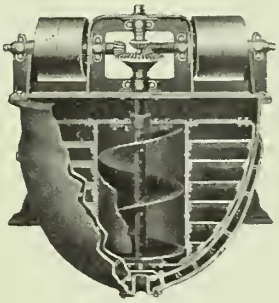
YOU SHOULD HAVE THIS CATALOG

It is yours for the asking.

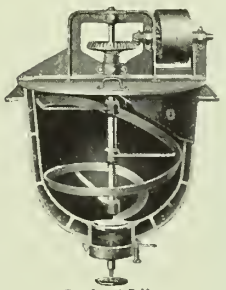
Style "B"
Bracket Type Agitator



Style "J"
Outside Sweep Agitator



Style "A-D"
Double Motion Agitator



Style "L"
Ribbon Type Agitator

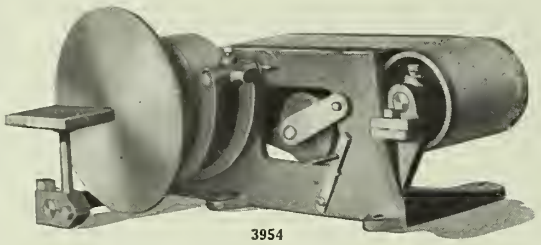
SOWERS MANUFACTURING COMPANY

1315 NIAGARA STREET — BUFFALO, N.Y., U.S.A.

THE MOST LOGICAL — SHIPPING POINT INTO CANADA

ADOPT THE DOPP

To Prepare Metallographic Specimens



3954

Metallographic Belt and Disc Grinder

For Rough and Fine Grinding

Rough grinding of metallographic specimens is done by successively grinding on three endless, interchangeable carborundum belts—coarse, medium and fine.

Each successive grinding is made at right angles to the previous one until the previous grinding lines are effaced and all lines become parallel. The fine grinding is then made with emery paper attached to the circular disk.

PRICE, complete with set of grinding belts $60.00

Fisher Polishing Machine

By using the Fisher Polishing Machine and levigated alumina of the proper grade, the correct metallographic polish is obtained. The alumina is conveniently applied by means of a laboratory wash bottle.

PRICE, complete with 110-volt universal motor $115.00

4570

Levigated Alumina

For Metallographic Polishing

This is prepared by us by a special process developed in our own metallographic laboratory; it is free from rough particles and is much more satisfactory than rouge.

3957 Alumina, grade No. 1. For all hard metals. One ounce makes 50 ounces of correct polishing solution. **Price, per ounce $1.00**

3957 Alumina, grade No. 2. For medium-hard metals. Especially suitable for cast-iron, bronze, brass and all nickel and copper alloys. One ounce makes 100 ounces of correct polishing solution. **Price, per ounce $1.40**

3957 Alumina, grade No. 3. For very soft metals and other metal specimens for investigation under highest possible magnifications. One ounce makes 167 ounces of correct polishing solution. **Price, per ounce $1.80**

SCIENTIFIC MATERIALS COMPANY

"Everything for the Laboratory"

PITTSBURGH, PA.

CANADIAN CHEMISTRY AND METALLURGY

Vol. VII., No. 6 | TORONTO, JUNE, 1923 | $3.00 a year

MAURICE A. KNIGHT ACID PROOF CHEMICAL STONEWARE AKRON, OHIO, U.S.A.

Guaranteed

Acid-Proof, Vitrified, Salt-Glazed

CHEMICAL STONEWARE

Our ware will withstand the action of Acids, Alkalies and Chemicals, hot or cold, strong or weak.

ALL SIZES
ANY QUANTITY
ANY DESIGN

WRITE FOR
COMPLETE
CATALOGUE

FIGURE 271
STRAIGHT LENGTH SOCKET PIPE

FIGURE 237
ACID PROOF LABORATORY SINK WITH BACK

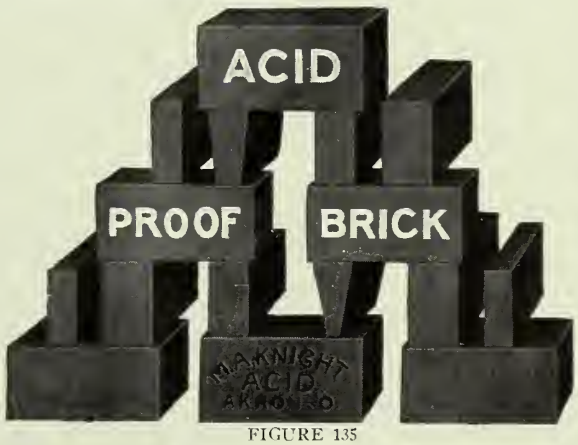


FIGURE 135
ACID PROOF VITRIFIED BRICK

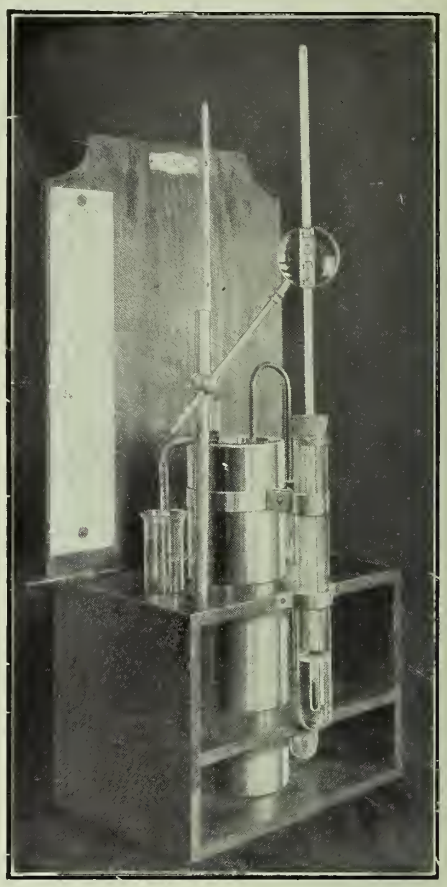
Maurice A. Knight

Akron Ohio

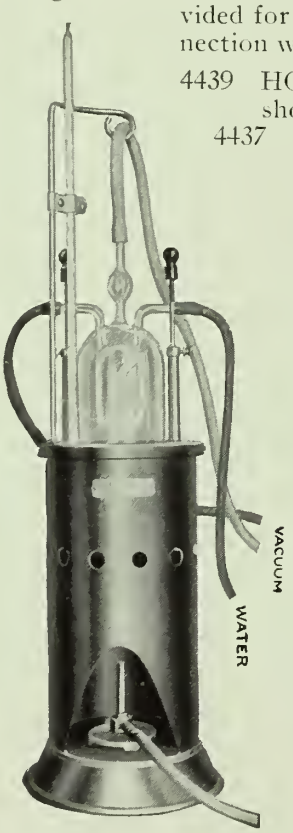
18 Years

FIGURE 295
ACID PROOF THREADED STRAIGHT-WAY COCK

HORTVET APPARATUS



Cut at top shows the HORTVET CRYOSCOPE with attachment for supporting test tube and thermometer in suitable position for melting point observations. The Hortvet Cryoscope has been adopted by the Association of Official Agricultural Chemists as the official instrument for determining added water in milk. The American Public Health Association has also made it official. When ordering, it should be specified for what purpose the instrument is intended; also ranges of temperature desired. The metal clamp and band attached to the Cryoscope, as shown in the cut, allow the test tube and thermometer to be supported in convenient position for the further observation of melting points on substances such as aniline, butyric acid and benzole, which have been properly solidified. Similar tests can be made on oils and other liquids. Specially designed test tube with side tubulure near the top is provided for making freezing point tests in connection with molecular weight investigations.



4439 HORTVET CRYOSCOPE, as shown in cut **$70.00**

4437 Without clamp and tube but with special thermometer for milk testing **75.00**

Write for Bulletin 284.

HORTVET SUBLIMATOR shown in cut at bottom of page. Designed for the separation and purification of many substances by sublimation under partial vacuum. Recommended for the separation of pyrogallic acid, benzoic acid, oxalic acid, iodine, naphthalene, etc., from impurities; the separation of strychnine, morphine, santonin and other active principles from crude drugs; the separation of caffeine from coffee and tea, gentian from gentian root, and cantharidin from cantharides. By means of the Sublimator a distinction can be made between genuine tea leaves and tea substitutes, between genuine Levant wormseed and the domestic variety, and also between standard and exhausted drugs. Arsenic and many other substances may be sublimed on the plate, examined under the microscope and the results of other tests confirmed.

6513-1A SUBLIMATOR, glass part only **$22.00**

6513-1F SUBLIMATOR, metal part only, including burner.... **28.00**

Write for Bulletin 306.

We have no Canadian branch. However, the concentration of materials in New York enables us to make prompt shipments to Canada.

EIMER & AMEND

Established 1851

HEADQUARTERS FOR LABORATORY APPARATUS AND CHEMICAL REAGENTS.

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Phillips Square, Montreal

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For the Office Building

Intent upon providing ourselves with a home exemplifying the highest type of modern construction, we believe we have succeeded in utilizing Concrete and Reinforced Concrete to excellent advantage in the erection of the beautiful Canada Cement Company Building.

To those unfamiliar with recent developments in Concrete Construction, the decorative effect secured with manufactured Stone will prove a revelation; while in the interior arrangement of bright sunlit offices, we have endeavored to express our idea of what a modern office building should be. Our confidence in its fire-resisting qualities is evinced by our decision to carry no insurance on the structure.

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CONCRETE
FOR PERMANENCE

CANADA CEMENT COMPANY LIMITED

CANADA CEMENT COMPANY BUILDING
Phillips Square Montreal

Sales Offices at

MONTREAL TORONTO WINNIPEG CALGARY

ONTARIO'S MINERALS

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

Hon. H. Mills, Minister. *Thos. W. Gibson, Deputy Minister.*

Preliminary Summary of Mineral Statistics

(Quantities represent shipments. Tons throughout are short tons of 2,000 pounds)

Product		1921		1922	
		Quantity	Value	Quantity	Value
METALLIC					
Gold	ounces	709,509	$14,624,085	$1,000,199	$20,674,109
Silver	"	8,412,059	5,497,160	9,167,846	6,491,271
Platinum metals (a)	"	915	51,060	642	38,884
Copper	lbs.	3,070,719	356,708	4,503,358	515,093
Nickel, metallic	"	5,430,147	1,825,359	11,175,326	3,171,434
Nickel, oxide	"	1,402,019	285,391	2,399,887	391,119
Cobalt, metallic	"	32,718	98,228	109,067	282,602
Cobalt, oxide	"	155,554	354,418	398,697	798,271
Other nickel and cobalt compounds and residues	"	108,814	114,069	1,070,935	255,034
Copper in matte exported (b)	tons	3,686	737,142	7,774	1,554,731
Nickel in matte exported (b)	"	4,850	1,939,851	8,689	3,475,649
Iron and briquettes (c)	"	100	459	4,304	25,261
Iron, pig (d)	"	82,838	2,079,729	14,052	340,730
Lead, pig	lbs.	3,570,222	190,843	2,895,695	173,742
Zinc (e)	"	.....	.....	100,283	2,181
Total metallic		.....	$27,574,202	.....	38,190,711
NON-METALLIC					
Actinolite	tons	78	$ 975	$ 50	$ 345
Apatite (Phosphate of Lime)	lbs.	.....	.....	31	248
Arsenic, white	"	2,982,525	233,763	4,118,695	299,940
Arsenate of Iron	"	.....	.....	75,000	938
Corundum	tons	402	50,250	.....	.....
Feldspar, crude and ground	"	15,506	114,059	15,515	94,985
Fluorspar	"	115	1,744	284	3,905
Graphite, crude and refined	"	363	23,273	626	34,124
Gypsum, crushed, ground and calcined	"	84,765	433,053	110,227	621,668
Iron Pyrites	"	19,375	91,604	11,235	39,763
Mica	"	222	29,630	2,229	56,480
Mineral water	Imp. gals.	.....	9,000	31,970	6,118
Natural gas	M. cu. ft.	8,590,000	2,953,000	7,919,390	3,902,800
Peat	tons	500	2,000	3,000	14,500
Petroleum	bbls.	172,859	466,716	164,732	439,286
Quartz and silica brick	tons	12,957	74,635	82,882	149,302
Salt	"	149,599	1,509,287	161,551	1,537,512
Talc, crude and ground	"	9,967	140,390	12,874	178,397
Construction Materials—($11,527,529)—					
Cement, Portland	bbls.	2,723,072	6,425,266	3,104,386	6,235,370
Lime	tons	91,355	1,172,680	116,769	1,315,479
Sand and gravel	cu. yds.	1,412,956	668,098	2,132,875	1,001,088
Sand-Lime brick	M.	.....	456,700	48,924	770,597
Stone, building, trap, granite		.....	1,812,863	.....	2,205,025
Clay Products—($5,103,618)					
Brick, common	M.	99,463	1,743,094	105,536	1,803,349
Brick, pressed	"	31,481	673,087	44,892	900,111
Brick, tapestry or rug	"			22,453	514,666
Tile, drain	"	9,910	250,040	10,110	260,312
Tile, building and floor		.....	211,529	.....	562,566
Pottery		.....	67,985	.....	88,889
Sewer pipe		.....	939,464	.....	973,824
Total non-metallic		.....	20,554,185	.....	24,011,458
Add metallic		.....	27,574,202	.....	38,190,711
Grand Total		.....	$48,128,387	.....	$62,202,169

(a) Recoveries from Canadian and United States refineries. (b) Copper and nickel exports in the form of matte were valued, respectively, at 10 and 20 cents per pound. (c) Exports and shipments to points other than Ontario blast furnaces. (d) Proportional product from Ontario ore smelted. (e) Recovery from concentrates shipped in 1919 and not previously reported.

Dividends and Bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies, or a total of $114,334,884.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

For illustrated reports, geological maps, mining laws, and list of publications, apply to
Thomas W. Gibson, Deputy Minister of Mines, Parliament Buildings, Toronto, Ont.

Complete Service

By *Complete Service* we mean that when desirable we actually perform every part of both design and construction with our own forces. We make investigations, reports and preliminary plans, and then design, construct and equip the work in its entirety.

This service includes not only the buildings and other structures involved in the general scheme, but also railroad sidings, sewer, water and electrical distribution systems, streets and sidewalks—in fact, all facilities required to convert a vacant site into a modern plant completely equipped and ready to operate.

This *Complete Service method* is particularly advantageous for many reasons, not the least of which is the fact that our close central control of all parts of the work produces a smoothness and speed difficult to obtain when many organizations are at work on the same project.

We also construct from the plans of other engineers

DWIGHT P. ROBINSON & COMPANY

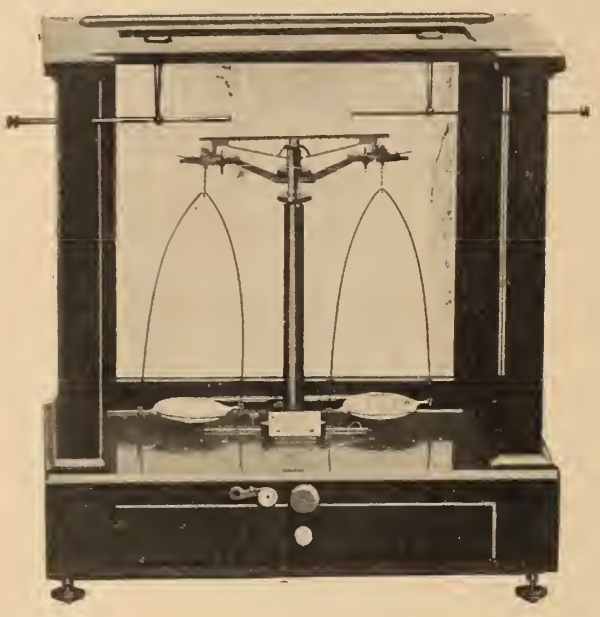
INCORPORATED

ENGINEERS AND CONSTRUCTORS

Dominion Express Building

MONTREAL

New York Chicago Philadelphia Youngstown Los Angeles Rio de Janeiro



BECKER'S (Rotterdam) HIGH-GRADE BALANCES

Two Leaders in Stock for Immediate Delivery

BALANCE—Becker's Sons (Rotterdam), capacity 200 grams in each pan, sensitive to 1/20 milligram, beam of aluminum, 6″ long, divided on both sides into 1/10 milligram. The rider may be used on either side of beam. The bearings and knives are agate. Mounted on heavy glass plate in glass and mahogany case with glass top and counterpoised door. With riders, specific gravity support, weighing tube support with counterpoise, and key with which the drawer and door may be locked. This is Becker's Standard Analytical Balance **$135.00**

BALANCE—Becker's Sons (Rotterdam). Short aluminum beam, 6″ long, graduated to 1/10 milligram, capacity 100 grams, sensitive to 1/20 milligram. Bearings and knives of agate, mounted on heavy glass plate in glass and mahogany case with glass top. Beam with rider arrangement. With arrangement for arrest of beam and pans. When the balance is at rest the bearings and knives are not in contact **$100.00**

WEIGHTS—ANALYTICAL—Highest Accuracy, Becker's Sons (Rotterdam) make, put up in mahogany box with removable lid. The gram weights are lacquered brass; the fractions of grams solid platinum, except below 50 milligrams, which are aluminum. 100-gram piece and down to 1 milligram and three riders **$26.50**

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IN OUR STOCK FOR IMMEDIATE SHIPMENT
OF SERVICE

The initial order from which shapes and sizes were determined, moulds were made and manufacturing established, was placed by us in the spring of 1915.

Announcement of the first available stock was made by us—through the courtesy of the Corning Glass Works—in October, 1915, since which time we have been the largest distributors.

We carry a stock of approximately 3,000 cases in our Philadelphia warehouse, which enables us frequently to make more prompt shipment of large assortments than is obtainable from either factory or other dealers.

Sales since January 1st, 1923, are 40% in excess of factory production schedule, and we have already been compelled to restrict our commitments for future delivery lest our allotment—already contracted for to October 1st, 1923—be oversold.

The following quantity discounts from current list prices were established on February 10th, 1923, for the benefit of large consumers:

10% discount in original cases (as heretofore)
10% and 10% discount in 100-case lots (truckload)
10% and 20% discount in 400-case lots (carload)

and we recommend early engagement by those whose requirements involve considerable quantities.

LARGEST DISTRIBUTORS
PYREX FLASKS AND BEAKERS
Since first announcement in 1915

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—Theodore Roosevelt

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So much interest and close co-operation has already been evidenced that the success of

AMERICA'S MOST IMPORTANT INDUSTRIAL EXPOSITION

is assured, and there is every indication that this year's Exposition will be the greatest of its kind in the country, if not in the world.

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GRAND CENTRAL PALACE, NEW YORK---SEPTEMBER 17th-22nd

(The Only Chemical Exposition To Be Held This Year)

Everyone who knows what a tremendous factor chemical knowledge is to every industry "owes some of his time" to directing the attention of executives to the great benefits to be anticipated by a visit to this Exposition. There is no industry in the country that cannot be helped by the ideas to be given at this Exposition.

One of the important features will be the presentation of ways and means to enhance labor productivity. The utilization of waste products will also be given special attention.

Exhibitors are making elaborate plans to have this year's exhibits surpass any showing made during previous years.

For further information address National Exposition of Chemical Industries, Grand Central Palace, New York

Manufacturers of—

HEAVY CHEMICALS

HEMATINE
LOGWOOD

DYESTUFFS

MONOPOLE
BRILLIANT OIL,
TETRAPOLE

ACID, ALIZARINE, CHROME, DIRECT,
BASIC and SULPHUR COLORS

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Limited

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Head Office: TORONTO

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BOILING KETTLE
Made in sizes from 15 gallons up to and including 250 gallons capacity.
See Bulletin E.

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Acetic Acid	Hydriodic Acid	Nitric Acid	Salicylic Acid
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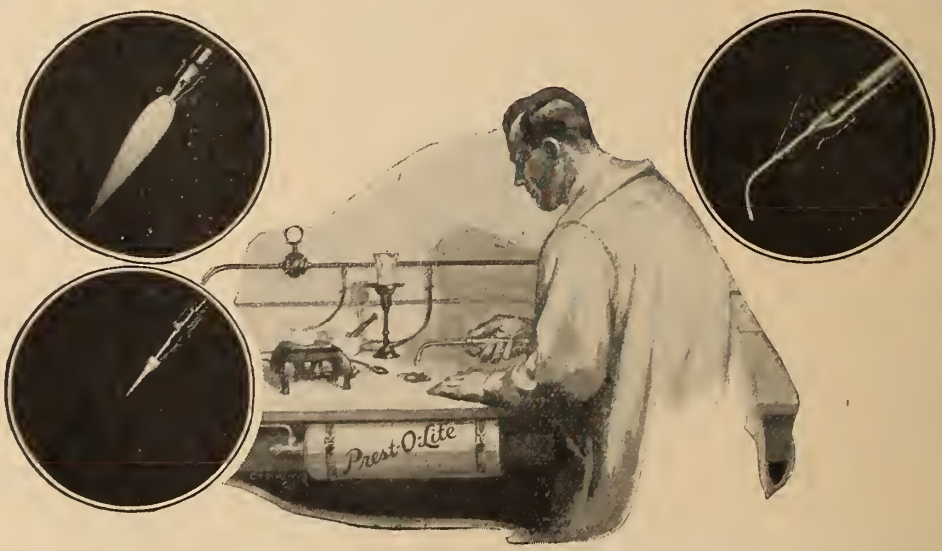
Battery Acid	Lactic Acid	Phosphoric Acid	Sulphurous Acid
Chromic Acid	Mixed Acid	Phthalic Acid	Tannic Acid
Citric Acid	Molybdic Acid	Picric Acid	Tartaric Acid
Formic Acid	Muriatic Acid		

Our Engineering Department will help you solve your problems.

GENERAL CERAMICS CO., 50 Church St., New York City



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The Prest-O-Torch—a blowpipe used with Prest-O-Lite Gas and compressed air only—places at the disposal of the chemist the hottest flame suitable for all laboratory requirements.

Metals are rapidly melted with the flame, yet the temperature is not high enough to be injurious.

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In the last analysis, results are the determining factors in any success—and ours has come because of the highly successful results our customers achieve with our products.

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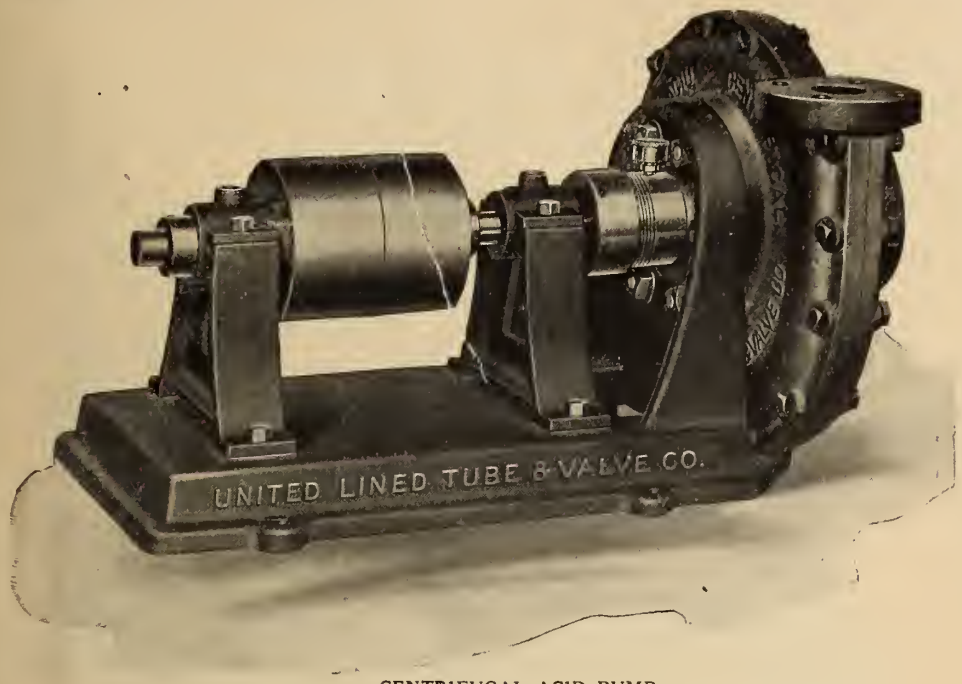

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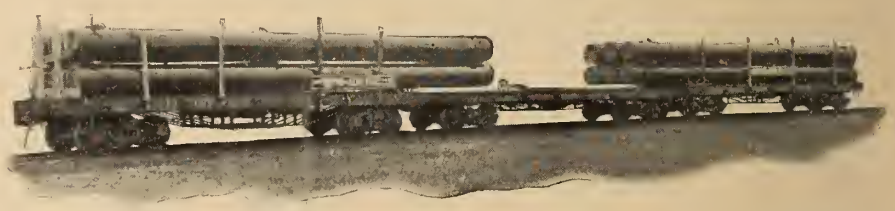

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Containing Official Announcements of The Canadian Institute of Chemistry

Vol. 7 No. 6 TORONTO, JUNE, 1923 $3.00 a Year; 40c a Copy

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From the Publishers—

Beware the Price-Cutter

Nearly everyone who buys anything, be it chemicals, equipment, or what not, has met the individual or company who is always willing to cut quotations to almost any level to get business. Just now, when competition is so keen, especially in the chemical market, we would like to warn our readers against the wiles of the price-cutter, and in doing so we cannot do better than to quote from a recent editorial in "Drug & Chemical Markets" (New York):—

"Only simpletons believe the hackneyed tale, 'we will undersell everybody to get your business.' Sensible men realize that in the long run they pay for the goods plus profit and interest, and they would close their ears to business fairy-tales. Just so long as one remembers that we are all in business to make a profit; just so long will one evade the subtle wiles of the apparent habitual price-cutter. To shun the house whose prices are always suspiciously low, is frequently to avoid second-rate merchandise and sharp practice. Competition drives prices sooner or later to the lowest level compatible with sound business, and the house which always goes below this level—let the buyer beware."

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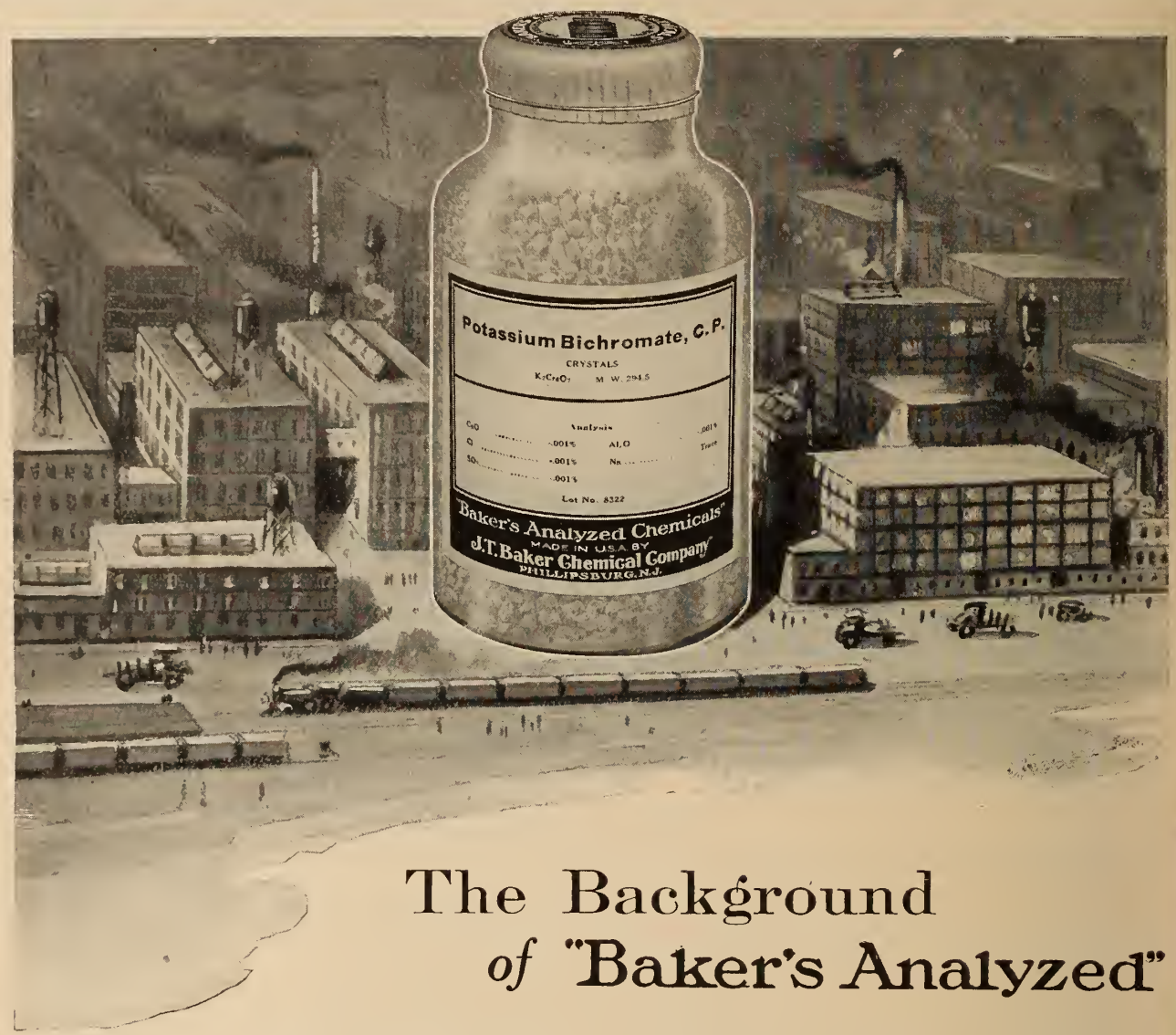

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Contents—Issue Number 38, Issued on December First

Rapid Method for the Determination of Phosphorus in Brass and Bronze, by J. Casner and Wm. Kuebler. Determination of Alcohol in Mixture, by Simon Mendelsohn. An Improved Burette Jet, by Wilfrid B. Ault. Notes on the Determination of Sulphur in Iron and Steel, by Henry W. Kasper. Quantitative Determination of Carbon Dioxide, by J. T. Donnelly. The Use of Alundum in Connection With Calorimetric Determinations, by Paul F. Hoots. An Improved Volumetric Method for Determining Sulphur in Iron and Steel, by Sylvester A Weigand. Determination of Zinc in Fluorspars, by W. V. Brumbaugh. Good Practical Methods for the Determination of Molybdenum in Steel, by S. Little. Method for Determination of Uranium in Steel, by S. Little. The Determination of Nickel in Steel, by Robert J. Peters.

EDITORIALS

CONVENTION COMMENT

WHEN conventions of chemists in Canada are compared with much larger meetings, the return per individual in attendance is probably quite high. One does not need several bodies to be in attendance at concurrent group meetings, and there is still some chance of personal contact with representative chemists from all parts of the country.

The Toronto meeting lived up to past records in allowing that essential personal contact of kindred minds for at least a three-day period.

The Society of Chemical Industry reported considerable activity during the year. The various sections have been awake to matters of special industrial interest, and the manner in which the branches handled proposed patent legislation is a credit to the Society and the individual members directing the work.

One result was attained by the reorganization of Canadian sections; but it is a question if the sense of co-operation is as strong now as it was when the burden of the affairs of the Society was carried by the Hon. General Secretary for Canada, Mr. A. Burton. It is true that co-ordinating machinery exists, but this should certainly be more in evidence.

The papers delivered were of a high order, and the problem of the publication of scientific articles and the results of scientific work in Canada is becoming more pressing. Papers presented at the joint meeting in Toronto will be found eventually in two rather restricted American publications, one well-known American chemical paper, and one English journal. Not a single paper will be published in complete detail in a Canadian journal.

It is very doubtful if this is the correct method of building up a credit for Canada in the world of science. The plans now under consideration, whereby assistance may be secured for the publication of a series of Canadian scientific journals, which will have a reasonable circulation, is an excellent one, and is something in which all chemists should be interested.

For some time, chemists' conventions have been following a triangular path. Perhaps there is a feeling that new ground should be broken. A convention need not be held in a large city to be a success; and there are many places throughout Ontario and Quebec where the holding of a convention would give much-needed publicity to chemists, chemical industries and chemical control. There are important industrial plants that very few have visited. Why not let the powers that be create a precedent, by holding the next convention anywhere but at Montreal, Ottawa or Toronto?

OPPORTUNITIES FOR TECHNICAL MEN

THE word "engineering" has been so overdone in many directions, and has been made to cover such a multitude of sinners, that we are not attempting to propose the application of the word to "Purchasing Engineer," "Cost Engineer," or "Sales Engineer."

We have in mind, though, that many men with a qualified education and training in chemistry and chemical engineering, would find successful employment in the purchasing office, the cost accounting department, or sales office of any large establishment. Such service would be profitable to employer and employed, and to the latter would not be any more "routine" than many jobs now performed in the laboratory.

Commerce and technology are necessarily interlocked. The commercial side would often be better off if the men in its offices had a trained knowledge of the industry. Many purchases would be made more intelligently; costs would be more accurate and without some of the grievous errors of commission and omission made by the man lacking a technical understanding of the operations. More sales would be made if the seller's representative was a man who could talk with convincing knowledge of the product offered.

The employer undoubtedly recognises all of this and would be willing to engage technically trained men if such men would themselves see the opportunities which "business" has to offer. It is quite as profitable to apply technical training to office jobs as it is to those in the plant. It certainly would be more satisfactory to all engaged in the industry.

Who could handle the purchases for a manufacturing company better than the fully trained chemical engineer, a man who does not have to follow blindly the too brief specification or requisition made by a foreman, who perhaps may be in error as to proper economical requirements? Who is better able to detail all the items of cost in a manufacturing process, the things that depend upon time and temperature, materials in quantity and waste, than the trained man who is familiar with the technical process and its true yield? And who is better able to sell the product, to help the regular user, and to find fields for further use, than the alert chemist who knows the why, where, and how?

The modern manufacturer wants trained men who are willing to get into the business end and show themselves able to progress in the industry by other paths than the laboratory.

List up a few firms and see how you can serve. The laboratory may be the hub, but remember that it is not the whole wheel. The opportunities are many and industry needs capable men. The laboratory in college and plant is the training ground. Not all can rise to greatness in it. Many can achieve a better measure of competence by making their laboratory knowledge a stepping stone to do more and better business. Consider your prospects within this suggestion if you are "resting" as the stage terms it.

PROFESSIONAL PROGRESS

CHEMISTS have just passed another mile-post in their progress toward a realization of their full professional development. When individuals stop long enough to consider themselves as distinct from their work, or, in short, when chemists meet, even for a moment, to consider chemists, as distinct from chemistry, they have entered upon professional ground.

The wonder is that this development has been so long delayed. The cause may be that the diversity of interests among chemists tends to separate, rather than to join. There are some who, for little or no apparent reason, and with considerable injury to their general usefulness, refrain from co-operative work along these lines. There should be nothing more stimulating to scientific or business ambitions than co-operative professional activities, and the day has passed when individuals can compete with organized bodies in directing their fair share of general matters of public interest.

There is something significant about the fact that chemists who have had the largest and most diversified expereince in meeting professional and business men, in industrial and public life, find something more home-like in a meeting of chemists than they do with any of their other connections.

Some, without being positive in any way, have a tremendous number of negative ideas. This negation is an obsession with some chemists, and indicates a weakness of fibre that is certain to do personal and general damage to the profession.

Chemistry is getting along very well in Canada, and the Canadian Institute of Chemistry is beginning to express the voice of the chemist a little more clearly all the time.

Supposing the goal of provincial legislation is reached but slowly, or is never attained, there is no reason why Canadian chemists should not set their own standards, make them high in a professional sense, become self-governing, and reap the direct and indirect benefits that always follow when intelligent individuals work together to serve both their own best good and other organized bodies in the state.

CAN YOU ?

ENTERPRISING journalists have from time to time had columns headed "Can You Beat This?" The writer has been given the following example on a creditable first-hand basis.

A concern engaged in an industry which included one important but very ordinary chemical process, engaged a chemist at $1,800, and patted itself on the back.

The chemist being young, inexperienced, and failing to secure the co-operation of the practical men, through lack of tact, did not produce any apparent economies. The firm, without informing their chemist, made an arrangement with a consulting chemist to help them out, but not to advise their plant chemist. They paid this consultant $3,600 per annum. Strangely enough, little improvement was noted.

"Surely", the firm considered, "This must be a weighty problem". They sought out then a much talked about firm of consultants and engaged their advise for a year on a basis of $4,000, but did not advise the other consultant or their own chemist. This was the situation at the latest advices.

Our source of information, it must be repeated, is quite reliable in ordinary matters. Can you beat it?

There are at least two things that might be observed here. First that it pays to advertise, and second that some captains of industry will have to be waited upon by the undertaker before the industrial chemist can come into his own.

We might add a word to the young chemist. Don't undertake to put a firm on its feet for $ 1,800 a year, without experience.

THE LEATHER INDUSTRY

THE leather industry in Canada comes within the thirty leading industrial activities of the Dominion. Many seem to feel that this industry is not as progressive as some others. This is hardly true. A gain of nineteen plants in one year, which was the record in 1921, is not a sign of decay. At the end of 1921 we had some 119 tanners listed in official reports. The total investment was $32,137,488 at the end of that year.

The tanning industry is not one that seeks publicity. It does not seek or receive much public attention. It carries on, secure in its universal service and age long history.

Chemistry and bacteriology have come to play a much more important part in this business.

Men of the broadest scientific training have been introduced to the industry. They have started in to fathom some of the problems and before they are through, we venture to think great modifications in practice will result. Their problems are as difficult as those encountered in any field, and it will require the full support of the capital invested, to produce maximum results.

This month, the chemists of the industry meet at White Sulphur Springs. Here, it will not be markets, but colloids that will hold attention. Curing will be reduced to a discourse on bacteriology. The practice of discounting or ignoring what we do not understand is passing away. Perhaps this is one of the big lessons that the scientist can teach the business world and right now the leather industry is coming forward in a scientific way with remarkable rapidity.

ABSURD LEGISLATION

ALMOST unbelievable was the result of the recent vote on oleomargarine. Our duly elected representatives at Ottawa, banished an excellent food product from the Canadian market by a vote of 125 to 54. Anyone reading the debates on this subject during the past few years must be amazed with the array of political and unscientific argument put up against the product.

In this case, the dairy interests have had their way and have stampeded a number of members into voting for what is supposed to be a wonderful vote-catching proposition. We question if the debate was carried on on the true merits of the matter. From the standpoint of health, the utilization of Canadian products that must find a market, and the building up of a very desirable industry, no points were raised that could possibly be given consideration, except for vote-catching reasons.

Oleomargarine made a very fine outlet for products of the farm in an indirect way, and the net result of such a vote will be to place Canada in the eyes of the world as a very unprogressive country, where a few short-sighted individuals are able to block the development of sound, but specialized industries.

Such absurd legislation will not stand for long, but, in the meantime, a growing industry must go under, at the command of another, that will not benefit one iota by the restricted legislation.

Mr. Milo R. Daughters, research director for the Dominion Canners, Limited, Brighton, Ont. has resigned to engage in business with the Polk Company of Haines City, Florida, canners of grape-fruit. A large part of Mr. Daughters' effort will be directed toward the utilization of citrus by-products.

Arthur C. Neish, President-Elect, Canadian Institute of Chemistry

PROF. NEISH is an outstanding example of the fact that everyone who goes to the United States from Canada does not remain there to the end of the chapter.

He is one of those Canadians who, after being duly impressed with the opportunities offered under the Stars and Stripes, always retained a remarkable ambition for his native country.

A Kingston boy from the beginning, he graduated from Queen's in '98 and proceeded to Columbia University, New York, where, from the position of a post-graduate student, he rose to the rank of Associate Professor. In 1919, he returned to Queen's, as head of the department of chemistry, which position he now occupies.

PROF. A. C. NEISH

During his career at Columbia, Prof. Neish established something of a record as a teacher of chemistry. Columbia gives ample scope for the art of teaching chemical principles in the most scientific manner, and, following '04, when his Ph. D. was taken, he came in contact with the necessities of all classes of students, from those whose major subject was chemistry to those who were studying the subject from the standpoint of the Department of Education of New York City. His influence on the teaching of chemistry throughout the United States was very considerably enhanced by his contact with teachers, who came to Columbia for special courses on this subject.

In chemical society affairs, always maintained a large interest. He joined the American Chemical Society, and the Society of Chemical Industry very early in his career. He has been for many years an active mamber of the Chemical Club of New York, and, on his return to Canada, at once threw his whole energies into Canadian institute work.

His activities have been by no means along teaching lines only. His position and associations allowed splendid opportunities for securing a good insight into a great variety of chemical industries. It was indeed this fundamental knowledge of practical

industrial and engineering operations that made possible his remarkable success as a leader in inspirational teaching. Chemistry is a very vital, growing, practical and everyday subject with his students.

His personal research work has been mainly in the field of the rare earths. In 1909, he was doing fundamental work on thorium, lanthanum, didymium and the determination of thorium in monazite. This was followed by studies in the preparation of pure cerium salts. Methods of preparation of rare earths by the formation of insoluble oxides and carbonates is a more recent contribution. In an entirely different field the common milkweed became a subject for chemical research.

As a professor, he combines business ability with the art of student leadership. He is exceedingly ambitious for chemists, and the application of chemistry to the development of our industries.

The Canadian Institute has secured this year an excellent leader and one who will never spare himself, when there is work to do. He has the team spirit and puts it into everything around him.

THE TARIFF FROM A CHEMICAL STANDPOINT

"Nothing very startling" might sum up recent tariff changes from a purely chemical angle. None of our established industries, while they believe thoroughly in protection, can see much use in paying a duty on the chemicals they require. Governments have been reasonable about chemical industries, when they were seriously undertaken, although the measure of the protection has never been what some manufacturers would consider ample; and it was only after considerable pressure that protection was granted in some cases.

Our chemical industries will yet have to battle their way with the interests of consumers, when the market gets a little larger. For example, Canada is a fine market for dyestuffs, and color-users are not exactly anxious that the industry be started in a small way, just to make something new that will need protection.

One of the strange things about a tariff announcement is the attitude toward some small item which enters commerce to a slight degree. If a duty is put on, or taken off, this little speck is noised about as if it really were a tremendous burden or a glorious blessing, in a national sense. A quite legitimate, personal interest, either far-sighted or short-sighted, keeps the tariff continually adjusting itself to the pressure brought upon it.

Beyond a few paint materials and artificial silks, chemicals were scarcely mentioned.

A more important matter was the bounty of 1½ cents a pound on copper bars and rods. This is limited in time, and will be off by 1928, unless renewed; but it does something for an industry in Canada that needs the assistance. British Columbia is our source, and eastern Canada the larger market.

The Consolidated Mining and Smelting Company at Trail, B.C., is in a position to take advantage of this, and it may be that some companies in the east will be stimulated to use Canadian copper to earn the bounty. The bounty arrangement has the advantage of not interfering with established regulations. Copper, when subject to drawbacks, is now in the 99 per cent. class, if used in making rods for telephone cable and trolley use.

CREAM OF MILK SUGAR FROM LARCH WOOD

One of the most unique and highly developed operations connected with the lumber industry is being carried out at Eureka, Montana, where Montana larch is being treated for the production of cream of milk sugar. Cream of milk sugar, or mucic acid, is a product of the sugar galactose; is extracted in its complex form; hydrolized; and then oxidized to form the acid derivative. The product is pure white and crystaline; it contains no impurities, such as metallic salts. It has a similar taste to citric acid, or tartaric acid, and does not deteriorate in standing. It has a wide field of usage in foodstuffs, soft drinks, jellies, jams, ice-creams, candy, medicine, etc., beside the advantageous applicability in the mordanting of cloth in dyeing. The large demand, however, is in the baking of bread, either for straight baking acid or for manufacturing self-raising flour, or baking powder. It has, approximately, twice the working strength of cream of tartar. The plant includes equipment for reducing the logs to finely divided condition. This plant deals with all the problems in the sawmill, pulping plant, sugar-extracting plant, and the intricacies of complete ozidation, precipitation, filtering and refining plant. Oxalic acid is also being recovered practically pure.—"Raw Materials Review" (London).

USE OF CASEIN FOR COATING PAPER

Writing in *Papeterie* of Paris, France, Mr. R. Miller states that though casein gives fairly good results, it is not so satisfactory as gelatin, as it is more prone to putrefaction, and must be prepared a relatively short time before use (less than forty-eight hours in summer). The addition of formaldehyde as a preservation has the disadvantage of thickening it and prevents it from working properly. Miller has found by personal experience extending over forty-seven years that borax and ammonia (10 per cent. of either) are the most satisfactory solvents and prefers borax to ammonia. But when the casein is to be mixed with substances having an acid reaction, it is well to add a slight excess of ammonia to prevent the casein from thickening. Foaming in the sizing tub can very readily be prevented by the addition of a little milk or oil of turpentine to the coating solution, or by allowing amyl acetate to drop slowly on the surface of the solution.

RUBBER FOR STREET PAVING

A use for rubber that has some possibilities is that of street paving. The town of Southwark, England, has had an interesting and successful experiment on this use of rubber. High Street, where the rubber was laid, carries traffic of 240 tons per yard width of road. After two years' trial, the town engineer reports that the rubber has stood up remarkably well showing a minimum of wear. It was laid in slabs, nine inches by three inches, vulcanized on expanded metal, and anchored to concrete.

AMERICAN ELECTROCHEMICAL SOCIETY

The next meeting of the American Electrochemical Society will be held at Dayton, Ohio, September 27, 28, and 29, 1923. The chief features of this meeting will be: a symposium on electrochemistry of gaseous conduction, in charge of Dr. Duncan MacRae, of the Research Laboratories of the Westinghouse Lamp Co., Bloomfield, N.J.; a symposium on electrolytic refining in charge of F. R. Pyne, of the U.S. Metals Refining Co., Cateret, N.J.; round table discussions on brass foundry practice, organic electrochemistry, chlorine and electroplating.

TANK SHIPMENTS OR RUBBER LATEX FROM DUTCH EAST INDIES.

It is estimated that some twenty thousand tons of rubber latex will be shipped from Deli, in the Dutch East Indies, during 1923. The latex goes by tank waggons to Belawan, where it is stored in a floating tank, from which it is conveyed to tank steamers. The first latex shipments were made in September and November, 1921, but in 1922 the shipments had totalled 646,532 kilogrammes by the end of October, imports being mainly by the United States.

Sixth Annual Convention

Members of Society of Chemical Industry and Canadian Institute of Chemistry Meet in Annual Session in the "Queen City"---Report of Proceedings

THREE glorious warm sunshiny days shed their cheering influence over the Sixth Annual Convention of Canadian Chemists, held at Toronto, May 29, 30 and 31, 1923. Over one hundred members of the two participating societies were present. The attendance of members of the Canadian Institute of Chemistry was particularly encouraging, chemists being present from every province, and almost every Canadian University was represented. Meetings were held in the Mining Building of the University of Toronto.

Tuesday, May 29th.

The Convention was convened at 10.30 a.m. in the large lecture room of the Mining Building. Dr. R. F. Ruttan, Chairman of the Overhead Council for Canada of the Society of Chemical Industry, while present at the meetings of council on Monday, May 28th, was unable to remain for any of the Convention Sessions. In his absence, Mr. L. E. Westman, Chairman of the Toronto Section, presided at the joint meeting of the Society of Chemical Industry and Canadian Institute of Chemistry, on the opening day. He welcomed the visiting chemists on behalf of the Toronto members and stated that the society of chemical industry had now become a real necessity owing to the growth of our industries. The position and significance of the overhead council for Canada of the society were matters that should be seriously considered. Personally, he doubted very much if the sections had been drawn closer together by it. The meeting was then thrown open for discussion and opinions on all matters relative to the Society were invited.

Mr. F. J. Hambly, chairman of the Ottawa section, regretted that no meeting of the overhead council had been held during the year as there were several important matters that might have been discussed, and on which the united voice of all the sections should have been heard. He thought that the several Canadian sections should be co-ordinated by a general council in which each section should have representation. Mr. Hambly referred briefly to the good work accomplished by the committees appointed by the Montreal and Ottawa sections regarding the proposed changes in the Canadian Patent Act. Due to the efforts of the committees the proposal to do away with examinations of patents was removed from the amendment, and examinations reinserted. In conclusion, he greatly regretted the lack of communication between Sections of the society and hoped that definite steps would be taken to remedy this defect. At the request of the chairman, Mr. A. E MacRae, Ottawa, spoke a few words about the patent legislation. It was a matter of some pride, Mr. MacRae said, that the society of chemical industry was the only organization, with the exception of the research council, that had taken an official part in connection with the patent legislation.

An important feature of the Bill, if it passes the Senate and becomes law, is that appeals concerning patents may be determined by arbitration instead of in the Exchequor Court, although the latter course will still remain for certain cases. Another important feature of the new Bill was that of section 16, which prevented the present custom of securing a patent on a product made by any process. The product must now be made by the particular process mentioned in the claim.

Mr. MacRae urged that all the sections take up seriously the matter of publicity. The Ottawa section had done sometihng along publicity lines. Different members of the section had prepared semi-popular articles for the daily press, which had been published in the Ottawa papers. But to make the effort really worth while some arrangement should be made whereby any section publishing such articles should have them printed simultaneously in several of the leading Canadian newspapers.

Speaking on behalf of the Toronto section, Mr. Westman stated that while nothing had been done in a publicity way so far as having articles published in the daily press, the section had been able to maintain during the past season, a close contact with certain industries. He instanced the case where nearly twenty of the leading tanners from Ontario had attended one of the local meetings devoted to a lecture and discussion on tanning. More might well be done along this line.

Dr. F. T. Shutt, Ottawa, had no hesitation in saying that he was opposed to publicity of the semi-popular kind. In his opinion there was a need, though, for a better system of having the papers given before the sections published. He did not think that enough material from Canada was appearing in the journal of the society.

Prof. Boswell, Toronto stressed the importance of building up the present Canadian publication. Much greater support could be obtained from the Government if all chemical matters, scientific and industrial were all brought together in one journal. In this way enough material could be secured to build up a good sized paper. Dr. Shutt also concurred in the view that all material

possible should be made available for "Canadian Chemistry and Metallurgy".

Mr. Hambly thought that the proper place for all the Society's papers was in the official journal of the Society.

Mr. Westman assured the meeting that the pages of Canadian Chemistry and Metallurgy were open at all times to practically all papers, addresses and items that might be sent in. Not enough material was received from Canadians, and he also thought that the journal of the society in England would be glad to publish all suitable papers forwarded. The editors of the society's journal were not receiving enough Canadian news.

There being no further discussion, Professor J. W. Shipley, of the University of Manitoba, presented the first paper on the program on "The Limits of Hydrogen Ion Concentration as Determined by Electrometric Titrations in Water Solutions of Carbon Dioxide, Calcium Sulphate and Calcium Carbonate", representing work done by Prof. Shipley and Mr. Ivan R. McHaffie.

The investigations of Prof. Shipley and Mr. McHaffie concerning the above equilibrium arose from the observed corrosion of iron pipe, buried in clay soils, and especially clay soils containing gypsum. Such corrosion has been observed in many widely-separated localities in England, Germany, Luxembourg and America. Some of the clay soils in Western Canada were found to have a corrosion action upon iron pipe buried in them. Since the corrosion of iron is known to be a function of the acidity of the surrounding medium, it was thought that a determination of the limits of acidity, due to CO_2, $CaCO_3$ and $CaSO_4$, would shed some light on the corrosion action observed.

Electrometric titrations of water solutions of the alkali bases, bubbling in CO_2, and recording the change in (H') by means of the hydrogen electrode, proved a very satisfactory method of titration, the end points for carbonate and bicarbonate being obtained, and the amount of CO_2, used in neutralization being registered by the rate of flow recorded in minutes. No end point for bicarbonate was produced in solution of $Ca(OH)_2$, when titrated with CO_2. Using an electrode vessel, protected from the air, electrometric titration of Na_2CO_3, and $CaCO_3$ with HCl, gave both end points; but, as the dilution increased, the amount of acid necessary to reach the CO_3 end point increased very markedly over that required to reach the HCO_3 end point.

The hydrogen ion concentration of all possible proportions of $CaSO_4$, $CaCO_3$ and CO_2, in solution in water, lies between the values of 4.12×10^{-10} and 1.1×10^{-4} gram ions per litre. Water in contact with $CaCO_3$ in the absence of gypsum and CO_2 will be basic. If gypsum be present, the (H') will approach the neutral point.

Ground or soil water, saturated with carbon dioxide at a partial pressure of one atmosphere, and in contact with soil containing limestone and gypsum, will be slightly acidic, having a PH of about 5.11. The effect of gypsum is to increase the acidity of ground waters when the soil contains calcareous material.

From the data secured, Shipley and McHaffie were able to calculate the degree of hydrolysis and the solubility product of some of the salt used; and the value of the primary and secondary constants for carbonate solutions was determined.

The value of the secondary constant for carbon-dioxide was found to increase with the dilution.

In the discussion that followed, Dr. F. T.. Shutt referred to the large number of practical applications of the work done by Prof. Shipley. The applications in agriculture alone were very wide. Much work had been done both at Ottawa and Macdonald College in determinating the PH of soils. It had even been discovered that the PH of soils had a good deal to do with the prevalence of cut worms.

The Drying of Peat

Following Prof. Shipley's splendid paper, Mr. H. A. Leverin, chemical engineer, Mines Branch, Ottawa, gave a very interesting detailed account of drying operations of peat under the title of "Investigation of Drying Conditions Involved in the Manufacture of Peat Fuel at the Alfred (Ontario) peat bog during the Seasons of 1921 and 1922". This paper will be dealt with more fully in a later issue.

Precious Metals of Canada

At one o'clock the meeting adjourned for luncheon at Burwash Hall, Victoria College, at which it was the privilege of the members to hear an address by Mr. Thos. W. Gibson, Deputy Minister of Mines, Province of Ontario. Mr. Gibson took for his subject the "Precious Metals of Canada—Gold and Silver". Many very interesting production figures were given by Mr. Gibson, showing in a vivid way the growing importance of Canada as a producer of gold and silver. Sixty-seven per cent. of the world's gold supply was produced in the British Empire and 40 per cent. in the Transvaal alone. Canada today is producing one-half the amount of gold mined in the United States and was the only country in the world where gold production was increasing. This fact was very important from an economic standpoint. The Porcupine field in Ontario had started from small beginnings iu 1909 and today was one of the largest groups of gold mines in the world. At the Hollinger Mine alone they were producing over $1,000,000 in gold per month. The Hollinger management hoped to soon reach a daily output of from 7 to 8,000 tons of ore, running from $8 to $9 per ton in gold. Over 100 tons of solid gold had been produced at Hollinger. It was his opinion and the view of many experts that the Porcupine field could be profitably operated for a good many years to come. The Kirkland Lake field, while not so large as the Porcupine, produced a considerably richer ore than Porcupine and could operate for a great number of years. The ore veins of Kirkland Lake extended northeastward into Quebec, where the recent discovery of gold at Rouyn had caused so much interest.

Turning his attention to silver, Mr. Gibson said Canada was particularly blessed with this metal. Over $200,000,000 of silver had to date been produced from the mines at Cobalt, Ontario. The flotation process had been the means of building up the Cobalt area. Over $100,000,000 in dividends had been paid by the silver companies of Cobalt.

In conclusion Mr. Gibson gave a very interesting account of the uses of gold and silver.

A vote of thanks to Mr. Gibson for his very excellent address was proposed by Dr. F. T. Shutt, seconded by Dr. A. E. McIntyre, and unanimously carried.

Tuesday Afternoon Session

Returning to the Mining Building following the luncheon, the joint session of the Society of Chemical Industry and the Institute was resumed, Mr. F. J. Hambly presiding. The first paper was presented by Prof. G. S. Whitby of McGill University on "Experiments with Accelerators of the Vulcanization of Rubber". Prof. Whitby has accomplished a great deal of valuable research work on rubber, and as the author of the work "Plantation Rubber and the Testing of Rubber" is well known to all rubber chemists.

The speaker described the effects, in regard to the rate of vulcanization, and in regard to the mechanical properties of vulcanized rubber, which could be produced by means of organic accelerators, taking, as examples, hexa-methylenetetramine and the dittriocarbonate derived from piperidine. The presence of zinc oxide has a tremendously favourable effect on the activity of the latter compound. The speaker went on to point out that the acids, which he had found to form a large proportion of the resin of rubber, were found to retard vulcanization in the presence of powerful catalysts, and that neutralization of the acids by the introduction of strong bases, was found to cause not only a remarkable increase in the rate of vulcanization, but also to enhanced tensile strength in the product. This

effect appeared to be due in large measure to the dispersing action of the soaps formed from the resin acids.

Experiments with a considerable number of organic sulphur compounds were described, and their bearings on the question of the mechanism of the action of vulcanization accelerators discussed.

Discussion: Dr. Boswell, University of Toronto, congratulated Dr. Whitby on his paper which he thought was both interesting and valuable. Dr. McIntyre, Ottawa, remarked that the mention of cholesterin by Dr. Whitby had brought to his mind the relation of cholesterin to the formation of gall stones. He believed that there was room here for considerable research in medical chemistry.

"The Manufacture of Insulin" was the subject of the next paper, which gave an account of the preparation of insulin at the Connaught Anti-toxin Laboratories, University of Toronto, by Messrs. D. A. Scott and C. H. Best, the paper being presented by Mr. Scott. No attempt will be made here to deal with this extremely valuable contribution, but it will appear in a later issue of this journal.

Studies on Oxides of Iron

Prof. J. B. Ferguson, Dep. of Chemistry, University of Toronto, following Mr. Scott's paper, gave a very interesting and valuable paper dealing with "Studies on the Oxides of Iron". A summary of this paper will appear in our July issue.

The afternoon session concluded with an address by Mr. S. J. Cook, chief of the Mining, Metallurgical and Chemical Branch, Dominion Bureau of Statistics, Ottawa, in which he reviewed the latest chemical statistics and trade conditions. This review of Mr. Cook's appeared in our May issue. Mr. Cook expressed the hope that from now on his department would be able to present to the Annual Convention of Chemists each spring, complete summary of chemical production in Canada for the preceding year. Such a report on mining is now presented each year to the annual meeting of the Canadian Institute of Mining and Metallurgy. He had however, been greatly handicapped in preparing similar chemical statistics owing to the lack of sufficient staff.

Industrial Development in Canada

Tuesday evening at 8 o'clock, members reassembled at the Mining Building to hear an address by Dr. Alfred W. G. Wilson, Chief Engineer, Department of Mines, Ottawa, on "Studies in Industrial Development in Canada, with Special Reference to Chemical and Metallurgical Industries". No more complete resumé of chemical and metallurgical industries, it is safe to say, had ever before been presented to a Canadian audience than was so ably given by Dr. Wilson. As chief engineer for the Department of Mines, he has many times had to deal with the industrial development of our natural resources and was therefore peculiarly fitted to speak with clearness and authority on this very wide and important subject. Probably the most important point brought out by Dr. Wilson was the absolute necessity of a thorough understanding and knowledge of all available statistics relating to natural resources on the part of any who may undertake their development. Sure disaster would follow any attempt to establish an industry depending on some natural resource for its raw material unless a complete knowledge was first acquired, not only of the resource itself but also of all trade and marketing conditions relative thereto. Had this always been done, many an investor would still have his money intact instead of squandered, as too often had happened.

Dealing first with the information that should be obtained before starting a development, Dr. Wilson emphasised several.

First—Trade policies. The present policy of the Government in matters of tariff affecting the industry including the raw material used, equipment, machinery, etc.

Markets—Everything possible should be found out regarding the markets for the products, both home and foreign. The United States Government recognized the importance of such data, and regularly supplied American industries with full details as to foreign markets.

Means of Development—Engineers, and general organization.

Finance—This was of course a very important point, and the speaker regretted the unfamiliarity on the part of many Canadian bankers with our resources. About 34 per cent. of the capital invested in Canadian mining and metallurgical developments was held in the United States.

Labor—No group of industries required better trained men than the chemical and metallurgical.

Administration—An important factor. Many developments have shipwrecked on this point.

Continuing, Dr. Wilson showed by views, comprehensive charts on the uses of many chemical products. These charts, which were viewed with great interest by many after the meeting, will be included in a Government report now being prepared by Dr. Wilson. This report will be published about the end of this year and will prove of great assistance to any contemplating commercial development work. Each chart was fully explained and the industry in each case thoroughly outlined. A bit of information that proved surprising even to many of the engineers present, was a list of some 256 uses of lime.

In conclusion, Dr. Wilson referred to the large amount of imports received by Canada each year. Such large imports were not necessary, and he believed that at least half of them could be manufactured in Canada. Prof. J. Watson Bain, Toronto, in expressing the appreciation of the meeting, to Dr. Wilson for his very able address, referred to the necessity of every one acquiring more information such as was outlined.

On Wednesday the Annual Meeting of the Canadian Institute of Chemistry was held, a report of which appears elsewhere in this issue.

Program for the Ladies

The convention was graced by the presence of a number of lady guests and for them a program had been arranged which proved very enjoyable. On Tuesday afternoon a sight-seeing tour of the city took place followed by a theatre party in the evening. Wednesday morning one of the basic feminine instincts was allowed full play by a tour of the shopping district, including a great number of real bargain counters. In the evening, the ladies of course attended the Annual Dinner and Dance.

Annual Dinner

The Annual Dinner has become an established feature of the chemists' convention, and has always been a most enjoyable affair and this year it proved no exception to the rule. No more appropriate surroundings could have been chosen than the Old Mill Tea Gardens, situated in the Humber Valley beside the ruins of the Old Mill from which it derives its name. No "heavy" program of speeches occurred, but on behalf of the Toronto chemists, Mr. W. A. P. Schorman spoke a few well chosen remarks, in the course of which he introduced the newly elected president of the Institute, Dr. A. C. Neish. Dr. Neish replied in a happy manner, enlivening the gathering with a few good "yarns".

After a pleasant social hour spent outdoors on the lawn and adjoining slopes, dancing took place, bringing the Toronto end of the convention to a very happy conclusion.

The Trip to Niagara District

Thursday, the concluding day of the meeting, was given over to an excursion through the Niagara district. At the early hour of 6.30 a.m. (standard time), the party of forty, including a number of the lady guests, boarded the steamer "Chippewa" for Niagara-on-the-Lake. The trip across Lake Ontario was most delightful. The invigorating fresh air, soon swept all the cobwebs from one's brain, and produced an appetite that

could hardly await lunch hour to be appeased. Arriving at Niagara shortly after 9.30 (summer time) a short walk through the historic town of Niagara, passing by old St. Mark's Church and graveyard, a landmark of over one hundred years, brought the party to the special trolley for St. Catharines. The trolley was boarded, the motorman sounded his gong, pulled over the controller, but no response. The car remained firm at its post. It simply wouldn't go. The situation was beginning to get exasperating. The party was due to visit the St. Catharines Silk Mills before lunch, and it was now nearly 10.30, and over 12 miles from St. Catharines. Here we were in the greatest electrical power development area of Canada, with mighty Niagara only a few miles away from which high power transmission lines carried energy that put life into big machines in industrial plants throughout Western Ontario and yet there wasn't enough juice to move this trolley's wheels. The power was not off, we were told, only the automatic booster station that was supposed to supply sufficient power to move cars away from Niagara was somehow not doing its duty. So much for automatic control in power stations. However, the delay was soon ended when a telephone message to St. Catharines quickly threw on additional power from the Falls—and the car was off.

A stop was made when the new Welland Ship Canal was reached. Here the party were given an opportunity of viewing a short section of this great public work in course of construction.

Arriving at St. Catharines, the party were taken by special car to the plant of the St. Catharines Silk Mills. The inspection of this plant provided a very interesting hour for the visitors. The products of the mills are underwear and gloves, and it was a source of real satisfaction to know that such beautiful goods as were here seen were being made in a Canadian plant by Canadian girls and men. Under the direction of Mr. Specht, Secretary-Treasurer of the Company, every operation was fully explained. The raw material is pure natural silk from Japan which is received at the plant in what are called "books" of three pounds each. This natural silk has a cost price to the mills of about $9 per pound. The "books" of silk are first made into warps by the warping machine, and are then put through the degumming process. After degumming they are sent away to the Riverside Silk Mills where they are thrown into one ply of three strands each, returned to the St. Catharines Mills, and wound on large spools. The silk is then ready for the weaving machine.

This machine is in itself a wonderful mechanism. The threads of silk coming from the spools are caught by a long row of needles and then so manipulated as to form the silk threads into fabric. The bleaching and dyeing room was then visited. Here amid tanks and centrifugal machinery, the silk is dyed and made ready for the final treatment in the drying and finishing room. On the second floor of the plant the actual fabricating of the finished goods takes place. The whole floor is well lighted, ventilated and modern in every way and from cutting out to inspection there are about twenty distinct operations on a pair of gloves.

Leaving the silk mills at 12 o'clock, the party motored to the Welland House, where luncheon was taken in company with the Rotarians. It is safe to say that the visiting chemists will not soon forget the very happy time spent here in the Rotarians own club room. It wasn't many minutes before everyone was heartily singing from the song sheets provided, and the whole gathering of rotarians, chemists and lady guests, were just like "one big happy family" before it was over. It was the pleasure of the visitors to hear a very able address given by Rotarian W. Kincade of Niagara Falls, N.Y., president of the Spirella Corset Company, on "The Human Element in Industry".

Following the luncheon the party left by motor for Thorold, on the way passing through the town of Merritton. St. Catharines, Merritton and Thorold are three busy industrial centres, and it was regretted that time could not permit a visit to several of their plants. As it was, the afternoon had to be limited to an inspection of the large plant of the Ontario Paper Company at Thorold. This mill is about the third largest paper mill in Canada, and is the largest mill entirely devoted to the production of newsprint. Its entire output, with the exception of some wrapping paper made from the chips and other waste material, is newsprint for the Chicago Tribune, owners of the mill. The wrapping paper is really looked upon as a by-product, and an interesting fact is that its sales have many times over paid for the machine and all costs connected with its production, and has for some time constituted a nice source of revenue.

The plant is very happily situated both for rail and water transportation. It is located right beside the present Welland Canal which at this point will also form a part of the New Welland Ship Canal. The mill has its own turning basin where vessels can unload and reload without interfering with canal traffic. The Canadian National Railway parallels the canal and provides a means of through rail shipment to Chicago, and also, when navigation is closed, is the means by which pulpwood is brought to the plant. The source of the pulpwood used is from the company's own limits on the St. Lawrence River, about 400 miles below Quebec.

Arriving at the plant, the party was welcomed by Mr. Derrico, the superintendent, and several of the staff who acted as guides.

The average daily production of the plant is about 290 tons of newsprint. This means of course that some days production will go as high as 310 or 311 tons. All of this output is consumed entirely by the Chicago Tribune, whose daily circulation is about 500,000, with a Sunday edition running over 1,000,000 copies. Eight 2,400 h.p. motors provide the power that drives the 33 grinding machines. About 10,000 cords of wood per month are put through the grinders. In the making of the newsprint at this plant, sulphite pulp is mixed with the groundwood pulp in the proportion of 80 parts of groundwood to 20 of sulphite. The limestone used in the process is secured close at hand from quarries at Thorold. The tow digestors are among the largest in America being about 50 feet in height, and 12 feet diameter. "Cooking" is accomplished in nine hours. There are five machines in all. Every modern device for handling the huge rolls of paper is used, and indeed a feature of the entire plant are the facilities provided for insuring rapid and successful production. Some members of the party whose interest in the manufacture of newsprint was satisfied with a shorter inspection took the opportunity of studying a rather important industry in the Niagara district. The plant of Canadian Grape Products, Ltd., at Jordan, illustrates the latest and best Canadian practice with production of grape products and wines. It is under chemical control and Mr. Meyer, chemist in charge, explained some of the problems being solved in the application of chemistry to this industry.

Returning to St. Catharines there was just sufficient time for motor rides through the pretty residential streets of the Garden City before leaving by special car for Niagara where the "Chippewa" was reboarded and the return trip to Toronto completed.

The Industrial Exhibits

One of the most interesting features of the convention was the exhibits of equipment and supplies for the chemical industry. Twelve firms were represented, including:

Sowers Manufacturing Company, Buffalo, N.Y. Dopp seamless steam-jacketed kettles were featured, and their application to industrial purposes explained. This equipment has won high favor with chemical engineers both in Canada and the United States. R. C. Boggess and T. W. Gillings were in charge.

Hoyt Metal Company, Toronto, Ont. Mr. Downs, in charge. This was a very interesting exhibit of acid resisting valves, piping, pumps, and fittings. The well known "United" lead lined valve was probably the most important product shown. Other equipment shown was: hard lead plug cocks, foot valves

and check valves; steel sheet, lead faced and covered, and also steel sheet with lead back and tin face, also tin faced and covered. The steel sheet lead faced and covered is used extensively for brine tanks, while the lead backed sheet with tin face is particularly adapted for food products. Included in the piping shown were the following: wrought iron pipe tin lined, brass pipe tin lined, copper pipe tin lined and covered, iron pipe tin lined and covered, all of which piping is used to a large extent in brewing and distilling plants; steel pipe tube lined and covered and copper pipe tube lined and covered used especially for brine solution work and acidulous liquors; acid resisting bronze, solid for pump shaftings and the hollow for bushing work or general acid equipment; "United" hard lead pump for handling acidulous liquors; babbit metal.

Powerlite Devices, Limited, Toronto, Ont.; Mr. N. E. Radford in charge. Bristol recording instruments, thermometers and pressure gauges, pyrometers. The six record strip-chart pyrometer was especially interesting, this remarkable instrument making six records of temperature, pressure, and heat. Electrical recorders; the Weston electrical testing equipment, ammeters, voltmeters. Such equipment is rapidly becoming a necessity in nearly all modern plants where accuracy and speed must be combined.

Ontario Wind Engine and Pump Company, Toronto, Ont.; Mr. L. P. Winslow in charge. Samples of B.C. fir and Gulf red cypress used in making "Ontario" tanks were exhibited. An increasing number of these tanks are finding their way into chemical and textile plants.

Refrigerating Engineers, Limited; D. S. Nicol in charge. While no equipment was shown, literature was distributed descriptive of Frick refrigerating equipment which finds a large number of applications in cold storage, ice-making, cooling, air conditioning, and a variety of industrial operations.

Canadian Laboratory Supplies, Limited, Toronto, Ont.; Mr. Harry Hall and Mr. Ivan Staples in charge. Quite a comprehensive exhibit of laboratory equipment was shown including several lines well and favorably known to Canadian chemists. Included in the display were: Thelco Electric Ovens, Alundum ware, Vitreosil, Microscopes, Oertling balances, Barnstead stills, the new Vacuum-Filter in which filtration is quickly accomplished by creating a vacuum in a jar to which is attached another jar containing the liquid to be filtered, multiple replaceable unit electric furnaces, Westphael specific gravity apparatus, and Baker's Analyzed Chemicals.

Central Scientific Company, Chicago; Mr. James H. Wilson. and Mr. S. L. Redman in charge. This company is well known to Canadian chemists as suppliers of general laboratory equipment. Including in their display were: De Khotinsky constant temperature appliance, rheostats, electric hot plates, rotary blowers, and the Hyvac pump for producing a vacuum of 0.001 mm.

J. Popper, Montreal, chemical glassware. Mr. Popper's display featured Kavalier Bohemian chemical glassware. This glassware is known for its remarkable ability to stand high temperatures, while at the same time it is light in weight. Flasks, pipettes, tubes, and many other pieces of apparatus were shown.

G. F. Sterne & Sons, Limited, Brantford, Ont.; Mr. E. T. Sterne in charge. A particularly fine display of chemicals for many industrial purposes. Of most importance were the products of the well known firm of A. Boake Roberts & Co., Limited, London, England. The samples of fine chemicals, soap bases, synthetics, and essences, and essential oils were very interesting. Samples of Sternson high temperature furnace cement and of Sternson super-refractory were also shown.

Harris Abattoir Company, Toronto, Ont.; Mr. W. G. McLeod in charge. This company had a very interesting display of vegetable oils for industrial purposes. Particularly interesting were the samples of hydrogenated oils.

Mr. McLeod who was recently appointed production manager of the new hydrogenation plant has had several years experience with vegetable oil refining in United States' plants.

Longmans, Green & Company, Toronto, Ont.; Mr. Peterson in charge. A very excellent display of books dealing with theoretical and applied chemistry. It was encouraging to note that such a wide variety of chemical literature could be secured direct from a Toronto house. Among the books attracting attention were: "Dictionary of Applied Chemistry" (Thorpe) Vols. I.–IV; Monographs on Industrial Chemistry; "Plantation Rubber and Testing of Rubber" (Whitby); "Manufacture of Sugar from the Cane and Beet" (T. H. Herriott); Monographs on Bio-Chemistry, Inorganic and Physical Chemistry; Metals and Metallic Compounds (Ulick R. Evans); "A Course of Practical Organic Chemistry", 3rd edition (Price and Twist); Mellor's Treatise on Inorganic and Theoretical Chemistry, Vol. I.–III.; "Chemical Analysis of Steel Works' Materials" (F. Ibbotson); "A System of Physical Chemistry" (W. C. Lewis); "Relativity", a systematic treatment of the Einstein theory (J. Rice).

Eimer & Amend, New York. While this company did not have an exhibit, Dr. F. W. Shulenberger, sales manager, was present, and renewed acquaintances with many at the convention. His company is well known to chemists, and Dr. Shulenberger is always a welcome guest at Canadian meetings.

Convention Committees

The following committees had charge of the arrangements for the convention:—

Finance: W. A. P. Schorman, chairman; L. E. Westman and W. C. Klotz.

Papers: Prof. J. W. Bain, chairman; Dr. Lash Miller and Dr. R. D. MacLaurin.

Entertainment: W. H. Thom, chairman; W. McNeil and H. D. Tefft.

Accommodation: Prof. J. T. Burt-Gerrans, chairman; Prof. L. J. Rogers, G. M. Hill and Geo. C. Benson.

Publicity: Prof. J. B. Ferguson and H. Martin.

Excursion: H. E. Rothwell and E. T. Sterne.

Convention Chairman: L. E. Westman.

Convention Secretary: G. N. Hill.

MONTREAL SECTIONS, S.C.I., ELECT OFFICERS

On Monday, the 16th of April, the Montreal section of the Society of Chemical Industry held its final meeting for this year. The evening was taken up with a paper by W. C. Munro, fourth year student in chemical engineering at McGill University, on "The Manufacture of Newsprint", giving a detailed description of the process, and by reports of the committees. The reports of the reception and membership committees showed that the section seems to have taken on a new lease of life, the total membership (both full and associate) being over 180, and the average attendance throughout the year about 60. The following officers were elected for the ensuing year: Chairman, F. W. Horner; secretary-treasurer, C. F. Bordorf; executive committee, J. B. Bell, Norman Holland, Prof. P. P. LeCointe, J. R. Macaulay, Dr. A. R. M. MacLean, C. C. McFee and W. B. Woodlands. Musical entertainment enlivened the proceedings.

Mr. F. W. Horner, the newly elected chairman, is the head of the firm of F. W. Horner, Limited, Manufacturing Chemists, 38 St. Urbain Street, Montreal.

At the meeting of the executive on May 16, the following were elected chairmen of the various committees: program, J. B. Bell; Reception, C. C. McFee; Membership, J. R. Macaulay; Publicity, W. B. Woodland; Entertainment, Norman Holland; French Section, Prof. Le Cointe.

Annual Meeting of Canadian Institute of Chemistry

Report of Proceedings and Motions

ONE full day was required to attend to the business of the Institute, review its activities and consider the very important report of the Legislation Committee. Activities were outlined for the coming year and in particular the question of a survey of chemists in Canada and a membership campaign were important items of new business.

President's Address

Dr. John S. Bates occupied the chair as president, and following a review of minutes and proceedings of the council for the past year by the secretary, delivered a very brief address as follows:—

"Last year I was asked to read a paper. Following that paper and in my absence the council elected me president of this worthy institute, which I very much appreciate. I shall speak only informally. It is not necessary for me to say much because the committee reports will cover what we have done and we will soon hear what we have not done from the members in the audience.

"In the beginning of the institute year, I as president, ran over what the committees were supposed to accomplish and had the secretary send instructions to these committees to start the year's work. You know what a job it is to get committees to work. The main task of the president is to get other officers and committees to do the work and personally I have succeeded, as far as my work is concerned, in not doing much more. Some committees and certainly the officers have done very considerable work during the year. I feel grateful as president to that extent. We have a special report of the committee covering By-laws and Model Bill. These have been put through in advance of the meeting, so we will spend a very few minutes summarizing conclusions.

"The council held four meetings during the year which were in line with suggestions at the last annual meeting. This has been a great step in advance to have regular meetings of council during the year, and I think a further improvement can be made.

"The most important meeting of council appears to be in September, when the fall term starts. We were given a grant of $300.00 for these council meetings, and I do not think this has been exceeded. We have also tried to keep the members informed as to what we were trying to do through circular letters from the secretary when we have nothing to say by publication in the *Canadian Chemistry and Metallurgy*, and also by the reprinting of important material such as you already read in the May issue. The policy of keeping members informed should interest them so that they feel they have a share in this organization.

"Another thing that has been accomplished fairly well I think, is that the council members have acted in their own localities to promote the interests of the Institute. This has resulted in the formation of two new branches of the Institute, namely the Maritime Branch, and the formation of the Western Ontario Branch. As you also know, council members have called what we might call informal meetings in their own localities. Two were held in Ottawa and one in Montreal. So we had actually several meetings of the Institute in different districts during the year. I think that was a distinct advance, and should be continued, and I think, furthermore, that we cannot hope to have more than one general meeting such as this. Individual members as well should feel it their duty and privilege to encourage and call meetings of the Institute in any district at any convenient time during the year, either separately or in conjuntion with other chemical meetings. I do not think there is anything that can take the place of this direct participation in the holding of meetings and it should be continued.

"Speaking of officers again, the secretary and treasurer are the real workers, and I would like at this time to express my personal appreciation of what Mr. Westman has done during the year. I, in my frequent connections with him by correspondence and by trips, have found him most thorough and businesslike. I think he has done a great deal to promote and advance the Institute. Also Prof. Ardagh as treasurer has given us very thorough and up-to-date knowledge of our finances. He has kept the officers and council informed continually as to the financial standing of the Institute, and as well has informed the members as often as possible. He has controlled our expenditure within our income, and an annual meeting always appreciates a statement of that kind.

"One brief word about the policy of the Institute. It is very necessary that the Canadian Institute of Chemistry should maintain, and if anything advance, its high standards and ideals. Very little more can be said, but it is well to think of the Institute as a bureau of standards among chemists.

"As regards organization we have been passing through several years of painful organization which is not the end, but merely the first means toward the end. We must not mistake organization for action. We have an organization, but the mechanism of this Institute is not worth the time we give it unless we thereby accomplish what we started out to do. On speaking of organization, personally I am inclined to think that the province should be the first unit. That is provincial sections are logical because they are in line with any later activity, and although they may not be handy geographically, they are logical from the organization point of view, and from the standpoint of legislation. Provincial sections then are suggested and in addition where necessary or in a few cases where desirable, local branches may be provided for in larger provinces like Ontario. As an example, the Western Ontario Branch has already been established. This raises the possibility of a change of representation. It might be logical to look forward later to local representation, that is the election of council members in that locality or in that particular branch.

"In conclusion it should always be well to realize that we are an organization of chemists. We are interested in ourselves for the moment more than we are in chemistry. The beauty of this Institute in my opinion is that we have the control in our own hands. It is distinctly Canadian and national in aspect, and if there are any flaws in our methods, we have ourselves to blame. Further, we have a direct personal interest in the welfare of this Institute because it is established solely for the benefit of chemistry and chemists themselves, and we have not only the privilege of showing our activity in this Institute, but also a duty to others who have started in the same profession. Further, I think that there is more than a usual necessity for members of this Institute to take a direct personal interest in the activities in every way possible. Please think in positive terms rather than in negative. Think in positive terms of what we will later accomplish and what we should accomplish for the good of ourselves and the Institute. I need not mention suggestions as to what we can do, they already have been made. For instance, a code of ethics. I think personally an Institute of this kind should put through a code as a guide as to what we should do. We should interest ourselves in educational standards throughout the Dominion, particularly those connected with chemistry.

"One purpose of the Institute is the promotion of legislation. We should clarify our objective in these things so that we may accomplish some real good for the profession. In these ways and a great many more there are opportunities for benefitting the chemists of Canada."

The Financial Situation

Following the remarks of the president, the secretary read the annual report, printed elsewhere. Prof. E. G. R. Ardagh explained in detail the financial condition of the Institute, basing his remarks on the statement already printed. He felt that this year members had expected economy, and they had received it, but he felt that it was possible to err in this direction also, and that perhaps at a little later date the Institute would be in a position to make more generous expenditures along necessary lines. During the year the keeping of accounts had to be put on a more systematic basis. In regard to the budget system, the Institute has been able to live very close to its estimate, coming through on the safe side.

Mr. Hambly moved a vote of thanks to the hon. secretary and Dr. A. E. Macintyre moved a similar vote to the hon. treasurer for the work done on behalf of the Institute during the year.

A resolution was introduced by Mr. H. J. Roast relating to the possibility of having the Carnegie Institute render assistance to the widow of the late Dr. John Waddell. A suitable resolution was drafted and ordered to be sent forward.

Publicity and Educational Service

Mr. W. C. Lodge opened the discussion on this subject and reviewed his experience as chairman of the committee for the Institute and for the Montreal convention. Several members including A. E. MacRae, Prof. Bigelow, E. T. Sterne, Dr. A. E. Macintyre and Prof. Burt-Gerrans spoke on this subject, and it seemed to be the opinion that publicity was not a good term to express the objects of the work. Mr. MacRae suggested the words "Educational Service". Prof. Burt-Gerrans summarized the discussion by classifying the material in two ways (1) General newspapers items and stories (2) Publicity for chemists and chemistry with individuals interested in chemistry and special industries.

Maritime Branch Report

The secretary of this branch, Prof. D. U. Hill of Acadia University, Wolfville, N.S., reported progress. At the meeting of the Maritime Chemists' Association last August, it was decided to join the Institute and this union will be completed at the next meeting, August 29th and 30th. It is planned to visit the Annapolis Valley, where applications of chemistry to agriculture will be studied. The Agricultural College at Truro will be visited and a motor trip made to Wolfville. Anyone visiting Eastern Canada around this time is urged to plan their trip to include this convention.

Mr. H. M. Lancaster spoke for the Western Ontario Branch, of which he was chairman, with Mr. Hambly, Prof. Parker and Mr. Roast reviewing activities in Ottawa, Manitoba and Montreal. The secretary reported on behalf of British Columbia, where no move has been made during the year in the matter of organization.

A Survey of Canadian Chemists

Mr. S. J. Cook introduced the discussion. The objective is to secure more members for the Institute from among those qualified as Fellows, Associates and Students. The plan is to have a committee make a thorough survey of the chemists of Canada and prepare a clear and convincing statement of the objects, benefits and reasons for a professional institute of chemists. With this accomplished, every member would be called upon to bring the institute to the attention of others. He outlined the development of a somewhat similar plan in the Professional Institute of the civil service. As an objective Mr. Cook suggested a total membership of five hundred by next May, which would mean an increase of two hundred for the year.

Some discussion arose on the question of inviting individuals to make application, but it was felt that there should be no hesitation in this respect, as the qualifications were stated with reasonable clearness. The plan was turned over to the council for immediate action.

International Chemical Union

On a motion by Mr. Roast and Dr. Macintyre, the fee of 1,000 francs for 1923 was ordered to be paid. In connection with the question of retaining membership, Dr. A. T. Charron summarized the reasons for keeping Canada represented through the Institute in a very forceful manner. Having attended meetings in France, he brought a full knowledge of the significance of events. He pointed out how difficult international action was and made his point very clear by referring to the rather slow organization progress within the Canadian Insititute. Some twenty-four countries are members. The objects of the international work were worth while and practical and the expense of membership was nominal.

In reply Prof. J. W. Bain stated that he was opposed to the present relationship. He pointed out that in his opinion it was quite wrong to have an organization, representing only some of the chemists of Canada as individuals, take on the burden of representing the nation in an international matter. The Canadian Institute is only one of the organizations in Canada that might take part in this matter. Various individual views were expressed which indicated that while the value of the work was clearly understood, the problem was simply one of securing the proper means of financing it.

Two motions were brought up, one by Prof. Bain which called for the resignation of the Canadian Institute at the end of 1923 unless the council could make financial arrangements independent of the members' fees and an amendment by Dr. Charron providing that the Canadian Institute retain its membership and instructing council to take steps to secure outside funds for the purpose, and with a provision that membership be dropped only when this has been demonstrated to be impossible. This amendment carried.

By-Law and Legislation Committee Report

In substance these reports were received and the general principles to be followed discussed. With this guide, the legislation committee will continue its work and present changes to members by letter ballot before the end of 1923. In connection with the Model Bill Mr. Roast pointed out that the question of provincial legislation was viewed at this time as an important matter in the province of Quebec. The bill as published would act as a basis for further consideration. On a motion by Dr. Macintyre and F. G. Wait the bill was to be left on the table for further consideration. The Institute as a Dominion organization can only function as a means of bringing chemists together by provinces for specific legislation when desired, but cannot as an institute represent the chemists of a particular province in a matter for the legislature. The very considerable amount of work accomplished by the legislation committee was appreciated by all present, following a motion to this effect by Mr. W. C. Lodge.

Definite motions were passed after full discussion and the following summarize the action taken:

Motions carried:—

That the financial year end 30th of April in place of 31st of December as at present, and that this change be made in the by-laws wherever this matter is at present recorded.

That the changes mentioned in the majority and minority reports, other than those of principle, be considered by a committee of the council and submitted to the members by letter ballot.

That the qualification prescribed for admission to membership in the Institute should be revised with the view of raising the standards, and the attention of the council is directed to the present regulations of the Institute of Chemistry of Great Britain and Ireland.

That the Canadian Institute of Chemistry continue its adherence to the International Chemical Union, and that steps be taken to provide funds for this purpose, without drawing upon membership fees, and further, that the Institute should not withdraw at the end of 1923 unless such funds were not available.

Amendment to By-Law 26, page 30.

That proposals to introduce new by-laws shall reach the secretary not later than March 31st of any year.

That original By-Law 18 regarding the representation of Provinces be not amended.

That the policy of forming provincial sections and local branches be approved.

That the matter of the proposed survey of Canadian chemists be referred to the council for action with the recommendation that a suitable committee be appointed to introduce and carry out some plan for increasing the membership of the Institute.

That the treasurer be appointed by council from the members of the Institute and that he be an ex-officio member of the council.

That the secretary be appointed by council from the members of the Institute and that the secretary be an ex-officio member of the council.

That the general principles underlying the report of the committee on amendments to by-laws be defined in a small number of motions, the details to be arranged by a committee of council and presented to the membership as a whole by letter ballot in the fall.

NEW MEMBERS OF INSTITUTE

The following have been admitted to membership in the Canadian Institute of Chemistry:

Fellows (F.C.I.C.)

Dr. Maurice E. Smith, P.O. Box 103, Halifax, N.S.; Samuel J. Lawellan, 508 Paris Building, Winnipeg, Man.

Associates (A.C.I.C.)

F. C. Donald, C o. E. A. Schofield & Co., St. Nicholas Bldg., Montreal, Quebec.; Guy C. Lordly, 274 Pitt Street, St. John, N.B.; Francis H. L. Taylor, Dept. of Chemistry, University of Saskatchewan, Saskatoon, Sask.; Otto Janesen Shierholtz, 120 Colborne Street East, Oshawa, Ont.

Transferred from Studentship to Associateship (A.C.I.C.)

Hugh M. Dignam, 139 Welland Avenue, Niagara Falls, Ont.; Colin Lewis O'Brien, C o. Bird & Son, Hamilton, Ont.

Students

Claude R. Mitchell, Macdonald College, Que.; Joseph A. McGarigle, Macdonald College, Que.; Walter H. Birchard, Queen's University, Kingston, Ont.

Annual Report of the Secretary, Canadian Institute of Chemistry

TO the members of the Canadian Institute of Chemistry, assembled at Toronto, on the occasion of the Fourth Annual Meeting of the Society, May 30, 1923.

This report covers the period, May 17, 1922 to May 29, 1923.

The activities of the Institute have been carried on by the following Committees:

Examination of Applicants.
Finance.
Publicity.
Paper and Publication.
Nomination.
Employment Bureau.
International Chemical Union.
Legislation.

In addition to this, the office of the Institute has been under the guidance of the treasurer and the secretary, and has carried on a very considerable amount of detailed work. in the handling of the business of the Institute and attending to a variety of general matters.

Considering the work along these lines, and bringing in, at suitable points, matters which hardly call for special mention otherwise, the activities for the year may be summarized.

Membership

One of the most important indications of progress within this Institute will always be the number of new members secured, and the number of those dropping out. This growth or loss considered in relation to a fair estimate of what our membership in Canada should be.

Statistics on Membership:

May 17, 1922: Fellows 166, Associates 39, Students 50, total 255.

May 29, 1923: Fellows 184, Associates 53, Students 64. total 301.

The outstanding deduction from these statistics seems to be that our growth is not so rapid as it should be, when the total number of possible members in all classes is considered. During the year, members have been urged to consider their personal responsibility in this matter, and I think that at this meeting we should consider organized ways and means of increasing our membership.

During the year, one Associate has been raised to the Fellowship, and eight students have taken out Associate membership. One application for reinstatement has been received and accepted.

While our membership is small, it is not to be anticipated that we shall escape losses through death, and, during the year, you will remember that two prominent Fellows have been removed by this cause. I refer to the late Dr. John Waddell, of Queen's University, and Dr. Henri Larouche, of Montreal. Dr. Waddell was one of the best known teachers of chemistry in Canada, and his character and personality left its mark on all those with whom he came in contact. Dr. Larouche, under normal conditions, had before him the best part of his career. In both cases, the Institute has extended its sympathy to the immediate relatives.

The condition of the membership indicates very fair stability. During the last few years, professional organizations and chemical societies have had the greatest difficulty in maintaining their total membership.

From one standpoint, I think that our membership is to be congratulated, in as much as we have had very few members withdraw, and in practically all cases, the only reason for doing so was a lack of the necessary funds. When it is considered that we have so many Canadian chemists who are willing to make

a sacrifice for the benefit of the future of the profession, rather than the present, our showing is indeed a good one. I do not know of any chemist in Canada who has ever been a member of the Institute, who does not retain the best goodwill for its activities.

In the matter of student members, Queen's University has again shown leadership, and if it were not for the fact that practically all the students at Queen's are members, our showing in this regard would not be impressive. During the last few years, very large classes have been attending all institutions where chemistry is taught. I am sure that the number of student members could be very much increased, if the professional spirit were taught more thoroughly in our undergraduate classes. From our student body, we must look for our growth in the Associate class; so that under normal future conditions, our student activities will be even more important.

There seems little doubt but that the membership of this Institute could be doubled, if each one of us would consider it his business to secure members. If this were done, the overhead would be reduced per member, and our position, as representing the chemical profession in Canada, would be much stronger.

In brief, probably the most important thing that the Institute can do during the coming year is to increase its membership, from among qualified chemists. Nearly all our activities can be brought back to this one prime necessity.

Finance

Your treasurer's report will deal with this in detail.

Publicity

This question has been discussed at council meetings, with the committee in charge. Because of the very considerable amount of money that would be required to attempt anything on a national basis, it was felt that this must be left in the hands of individual members. Some of our members have made excellent contributions to this end, although the institute was not directly benefitted.

As an indication of the difficulties involved in getting action on this, the result of the prize offered through the institute has a bearing. In spite of an offer of $50 and $25, for articles accepted by any Canadian non-technical paper with national circulation, not a single member of the institute showed any interest. In the face of this, it seems reasonable to suppose that our membership is not willing to work to secure this type of publicity for their profession, or for chemistry. The suggestion has been made that members interested in newspaper work contribute to their local papers, and do what they can to secure the correct publication of news of a scientific and technical nature. At a meeting of council, a general motion was passed, urging all members to take the floor on all suitable occasions and opportunities. Canada is securing some benefit from the work of this type carried on by independent organizations and the American Chemical Society, in the United States. Once again, this is a matter for individual members, and is largely dependent on their willingness to make some sacrifice in time.

Papers and Publications

Contributions of a scientific nature have been received from members and published in the journal during the course of the year. The practice now followed is to group reports of institute affairs and meetings in one section, with a suitable heading. Because the material available is uncertain, and frequently small, the idea of a distinct page has not been possible. It may be expected that, in future, as branches become active, there will be more material available. I think that the relation of the journal to the institute is not only clearly understood by members, but by others who may read it, and the task of reporting institute affairs has not been a burden. The practice of printing by-laws, etc., in the journal, allows the institute to have reprints at a nominal cost. During the year, the president, treasurer and secretary have addressed themselves to members by circular letters on different occasions. It will be remembered that this was done at the specific request of many members, as expressed at the annual meeting in 1922. Such letters are helpful in reminding members of their personal duty, and have their place, although the object of privacy is hardly attained. I doubt if the labor and cost involved is warranted except when the council has something really worth reporting, and there are few times when this could not more readily be done through the journal. At any time, this means of communication may become more important, and the Institute is well equipped to send out such letters.

Employment Bureau

You will remember the nature of the committee in charge: One council member in each province, and the secretary. In direct results, the employment bureau has little to report. At the same time, members of the Committee have interviewed a very large number of chemists, and I think that good suggestions have been handed along, which may have helped individuals to secure positions. A few men have actually been placed, and within the membership, there has been very little unemployment. Not more than two or three have reported that they were open for positions.

During the year, it was decided to restrict our activities to members. We were receiving many letters from American chemists. This did not lighten correspondence to any great extent, as each inquiry was given personal attention and reply.

The civil service commission is now co-operating with the Institute, and is on record as willing to consider Institute membership along with other qualifications. All government positions are announced to the secretary when open. In government and public appointments, membership in the Institute can be made to count, if treated in the right way. Other things being equal, Institute members should help each other first, when openings are available. If this is done, membership may soon seem more worth while.

The International Chemical Union

From the standpoint of the secretary, this is becoming a very important matter. If we are to have our full quota of active committees engaged in correspondence and co-operating with the union, it follows that the secretary will have considerable extra work, if he is going to keep in touch at all. At the request of the general secretary in Paris, committee chairmen were appointed, as announced in the journal. In many cases, they will be able to make real contributions to the work. In others, Canada has very little to report. As long as all this correspondence is handled direct with Paris by individuals, no extra work will be thrown on the Institute secretary; but should an occasion arise where the secretary ever undertook to coordinate the work of Canada in the International Chemical Union, I think it would be time to appoint an assistant secretary. This may be worth some thought, when considering the whole question of the part Canada should play in international chemical affairs. It would appear that as progress is made, probably a special International Chemical Union secretary for Canada should be appointed. Possibly, this is an activity that the government will finance completely, leaving to the Institute the honor and not quite so much of the work.

Policy

Early in the year, it was felt that a clarification of aims and objects of the Institute might be advisable. The engineering professions have devoted considerable attention recently to the question of policy. Our policy is to advance the profession of chemistry in every legitimate way. Means to this end may differ. Creating machinery for the sake of doing so may not be advisable. In almost every conceivable Institute activity, the question of policy comes up, and it is sound business to

inject the broadest possible views into Institute affairs. We must all think of policy, and, while no specific report has been developed, much thought has been given to the matter by council members.

Legislation and By-Laws

During the year, the special committee has been active and has made a full report.

Establishment of Branches

Progress along this line has been made. The president and secretary were able to attend the meeting of the Maritime Chemists' Association, and conveyed to that organization, last August, the desire of the Institute to bring about amalgamation, if a basis could be found. As a result, the Maritime Chemists' Association voted to become a section of the Institute, and it was found that all their members in good standing would be able to join our organization.

Final establishment of this will take place at their meeting in August next. Mr. C. C. Forward was chosen chairman, and Prof. D. U. Hill secretary of the maritime section. They were the officers-elect of the Maritime Chemists' Association.

The Western Ontario Branch was also duly established, with Mr. H. M. Lancaster, chairman, Mr. N. McCallum, secretary, and Mr. W. K. McNeil, treasurer.

At Ottawa, it was not felt that specific organization was required; and in Montreal also, the practice has been for local council members to call meetings when required.

In Manitoba no organization has been attempted, although Institute members have met to discuss matters of interest. Possibly by another year this organization will be definite.

In British Columbia members were asked to organize, but reported that they thought their number too small.

Examination Board

The members of the board have continued to deal with the greatest care with all applications; and I think the membership will be entirely satisfied with the justice and fairness of all rulings.

Council Meetings

During the year, four meetings of council were held. A quorum of five has always been secured and business has been facilitated. Matters of interest, arising from these meetings, have been passed along to members. This practice should certainly be continued, as it tends to maintain interest, keeps things moving, and decentralizes our activities.

As long as Canada remains as large as it is, it will not be easy to hold meetings of Dominion councils, and there is a reasonable limit to the amount of money that should be spent in this way.

Office Activity

Following the transfer of the working office of the Institute from Montreal (it should be remembered that Montreal is still the *legal* headquarters of the Institute) most of the office furniture was sold. The detailed work of the Institute is rather time-consuming, and will probably grow more so. It has occupied a very considerable portion of my office time. For me, it has been a pleasure, because I am so thoroughly convinced that over some such path the profession of chemistry must climb far, before it has arrived at its true altitude. Members of the institute should feel free to express their private views to the secretary and the council. Such letters are extremely valuable and should increase in number.

As for the future, that depends on you. The Canadian Institute of Chemistry can be made a thing of pride among chemists, and a power in professional and industrial affairs, if we stick with it, are reasonable, show that we are practical idealists, and render a real service to our profession and to the general progress of this country.

L. E. Westman,
Secretary.

NOTICE OF ELECTION

Council and Officers of Canadian Institute of Chemistry

New members of council, elected for term of three years: C. E. Wallin, F.C.I.C., Sydney, N.S.; H. W. Mathieson, F.C.I.C., Montreal; Dr. F. T. Shutt, F.C.I.C., Ottawa; Prof. Harcourt, F.C.I.C., Guelph; Prof. J. W. Shipley, F.C.I.C., Winnipeg.

President: Dr. Arthur C. Neish, F.C.I.C., Kingston, Ont.; 1st Vice-President: Prof. T. Thorwaldson, F.C.I.C., Saskatoon, Sask.; 2nd Vice-President: Dr. A. T. Charron, F.C.I.C., St. Hyacinthe, P.Q.; 3rd Vice-President: C. E. Wallin, F.C.I.C., Sydney, N.S.; Secretary: L. E. Westman, F.C.I.C., Toronto, Ont.; Treasurer: Prof. J. Watson Bain, F.C.I.C., Toronto, Ont.

MANITOBA CHEMICAL SOCIETY

The members of the Manitoba Chemical Society held their April meeting on the 27th, and had the pleasure of hearing a very interesting paper by Mr. Donald Binnington, Chemist at The International Laboratories, on "Paints and Varnishes". Twenty-five members were present.

Mr. Binnington stated, that, although paint and varnish had been investigated from a chemical standpoint for over 25 years, it was only within the past few years that real and extensive progress had been made, and that it was only since the physical chemist had brought his energies to bear on this subject, that real progress had been made.

Continuing, the speaker defined paint and varnish, and briefly described the principal raw materials employed, pigments, oils, gums, solvents, etc., and their methods of combination to produce the desired result.

In concluding, the speaker exhibited a number of lantern slides illustrating the manufacture of paint and varnish, and also a series of photomicrographs of pigments, illustrating very clearly, the varying physical nature of these materials.

Considerable discussion ensued.

W. A. Davidson,
Secretary

NEW BOOKS REVIEWED

"A Comprehensive Treatise on Inorganic and Theoretical Chemistry"

By J. W. Mellor. Vol. III. Cu. to Ba. Longmans, Green and Co., Toronto. Price $20.00

Here we have some nine hundred pages on copper, silver, Gold, Calcium Strontium and Barium. One of the features that will please many readers is the very extensive use of references. These are gathered together following each sub-section. This particular volume deals with chemical individuals and compounds that together make up quite a share of the mineral wealth of Canada. The labor gathering and classifying such an amount of material is really enormous and the value to the reader is in the same order. While the author is using original material of others, he has placed their work in such order that each section reads like a very condensed, but still most interesting lecture. Individuals will learn to prize it as a reference and the whole work gives every indication of long life and much useful service. It can be recommended to libraries and companies as standard equipment and every chemist and metallurgist should know where it may be fouud.

Dr. Richard B. Moore, chief chemist Bureau of Mines, Washington, has joined the staff of the Dorr Company, New York. In his new work, he will act in the capacity of consulting and research engineer, dealing with new applications of the company's equipment for handling finely divided solids in liquids.

Denatured Alcohol in Canada---II.*

Recoverability and Toxicity---Denatured Alcohol in Great Britain and United States---Industrial Alcohol for Motor Fuel---Quality and Price.

By ROSS E. GILMORE

FROM experience gained in the examination of the different grades of denatured alcohol, it may be remarked that it is quite possible to recover the different denaturants by special laboratory rectification methods; some are easy to recover and some are quite difficult. Although it does not necessarily follow that ease of recovery of the denaturants means ease of recovery of the ethyl alcohol, indications are that the easier the denaturants are removed, the easier it is to recover the ethyl alcohol in more or less the pure state; and as a general rule rectification on the commercial or plant scale is more efficient than in the laboratory.

It is more difficult to separate by rectification, into their component parts, two liquids which are similar in organic formulae and which are both miscible in all proportions in water than it is two liquids of unsimilar molecular formulae, and of different chemical properties. For this reason it is difficult to separate wood alcohol from grain alcohol. The immiscibility in water of the denaturants tend towards making their recovery easier, and the larger the variance between the boiling point of the denaturants and that of the ethyl alcohol is also an important factor in the ease of recovery of the component parts. Oils not miscible with water such as benzol and benzine and oils or solids with high boiling points such as pyridine bases, iodides and brucine sulphate are therefore not to be considered of high efficiency in making the recovery of ethyl alcohol difficult by ordinary dilution and rectification methods.

The question of toxicity in respect to denatured alcohols and denaturants is important and one on which much could be said. Only a few remarks will, however, be made here. All denaturants used in the manufacture of denatured alcohol have toxic properties which make grain alcohol poisonous to drink, and the degree of toxicity of the denatured alcohol will depend not only on the poisonous properties and quantity of the denaturant ingredient, but also on the amount of denatured alcohol taken internally. Most of the denaturants used, give warning by causing characteristic sickness of a more or less violent nature from which recovery is possible, providing too much has not been inbibed. There are those who maintain that this is the main purpose of a denaturant in respect to rendering the ethyl alcohol nonpotable. This, however, seems to be a viewpoint midway between two extremes, viz.—(a) That the denatured alcohol should have such an offensive odor and disagreeable taste that will insure its not getting past the nose or tongue and (b) that the main purpose of denaturing alcohol is to make the alcohol when taken internally extremely dangerous. All these viewpoints are of particular interest to the chemist in discussing toxicity of the different denaturants. Very little exact data appears to be available, expecially on the toxic effect of the different denaturants and of their individual ingredients. If the middle viewpoint is favored, viz.—that a denatured alcohol should not kill but should cause pain and sickness, then same would be an argument for reducing the quantity of denaturant to the minimum for this effect when ordinary quantities are taken. All this has a bearing on the analytical work required of the chemist and until some upper or lower limits of the ratio of toxicity of the denaturant to the quantity present in the final denatured alcohol are agreed on, a great deal of misunderstanding is more than likely to prevail. For example why is it necessary, other than for scientific purposes, to develop and use both qualitative and quantitative methods for the determination of methyl alcohol in quantities below say 1% (let alone 0.1%) unless it is known definitely just how much ethyl alcohol with this percentage can be taken internally without permanent injury. By qualitative methods dilutions lower than one part of methyl alcohol in 10,000 parts of solution can be detected and the lower limit of 0.1% i. e. one part in 1,000 appears quite determinable by quantitative methods: It is well-known that the impure grades of wood alcohol are poisonous when taken internally, but very little seems to be known re the comparative toxicity of the different ingredients going to make up the complex organic mixture known as methyl hydrate (wood alcohol). If it is true that pure methyl alcohol is far less toxic than the higher alcohols, ketone, aldehyde, etc., impurities then why is it necessary for the analytical chemist to prove or disprove the presence of small quantities or traces of methyl alcohol? The poisonous qualities of a denatured alcohol or say of a bootlegger's alcohol in which such as methylated spirits is suspected, may be due to impurities normal to grain alcohol, e.g., fusel oils etc., to a greater extent than to traces of methyl alcohol or other denaturants. These are only a few of the points that the physiological chemist may help to settle.

TABLE II—DENATURED ALCOHOLS AUTHORIZED IN GREAT BRITAIN

Name	Composition	General Uses	Conditions of Sale
GRADE 1—Industrial Methylated Spirits	95 parts ethyl alcohol 5 parts wood naphtha	Special manufacturing such as artificial leather, varnishes and polishes, soaps, drugs, and fine chemicals, incandescent mantles, etc.	Restricted
GRADE 2—Mineralized Methylated Spirits	89 5/8 parts ethyl alcohol 10 parts wood naphtha 3/8 parts petroleum	General industrial purposes, chemical and oil products	Restricted
GRADE 3—Power Methylated Spirits	92 parts ethyl alcohol 5.0 parts benzol 2.5 parts wood naphtha 0.5 parts crude pyridine plus yellow and red dye	Motor fuel preparations	Restricted

*Table I showing grades and composition of denatured alcohol authorized in Canada appeared in Part I of this article in our May issue.

According to the information at hand, there are apparently only three different grades of denatured alcohol authorized on the tax free list, in Great Britain. These are tabulated in Table II, where the name, composition, general uses and conditions of sale respectively are given. All three grades contain wood alcohol, and all come under the class of restricted denatured alcohols and in this respect they are all to be considered specially denatured alcohols when comparing with those of Canada and the United States. The third grade, viz.—power methylated spirits is a new grade, authorization of which is dated August 18th, 1921 (see Statutory Rules and Orders, 1921 No. 1318. No considerable quantity of this grade appears to have been consumed and the percentage of total consumption for grade 1 and 2 is given as roughly, 70% and 30% respectively. These British grades, viz.—1 and

*This is Part II and concluding instalment of this article. Part I appeared in our May ssue.

2, it will be noticed are quite similar to the United States specially denatured formula No. 1 and the Canadian grade No. 1 Benzine.

Denatured Alcohols in the United States

As mentioned above the denatured alcohols authorized in the United States are divided into two main classes, viz.—completely denatured alcohol and specially denatured alcohol formulae. There are six different grades of completely denatured alcohol for sale to the general public with very little restrictions or supervision. They resemble quite closely the formulae of the Canadian grades and their general use is no doubt the same as the Canadian unrestricted grades. The six U.S.A. completely denatured formulae are as follows:—

Formula No. 1—100 gallons ethyl alcohol
10 gallons approved wood alcohol
½ gallon approved benzine (kerosene)

Formula No. 2—100 parts ethyl alcohol
2 parts approved wood alcohol
½ part approved pyridine bases

Formula No. 3—100 parts ethyl alcohol
5 parts sulphuric ether
2 parts benzene
1 part pyridine

Formula No. 4—100 parts ethyl alcohol
2.5 parts approved benzol
0.5 parts nitrobenzol
0.2 parts pine oil

Formula No. 5—100 parts ethyl alcohol
2 parts approved wood alcoho
½ part pyridine bases
½ part benzine (kerosene)

Formula No. 6—100 parts ethyl alcohol
2 parts approved benzol
½ part approved pyridine bases
½ part approved benzine (kerosene).

The following comparison is to be noted:—

U.S.A. formulae No. 1 is similar to Canadian grade No. 1 Benzine.

U.S.A. formulae No. 2 is similar to Canadian grade No. 2 Pyridine.

U.S.A. formulae No. 4 is similar to Canadian grade No. 2 Benzol.

Specially Denatured Alcohols in U.S.A.

Up to the end of 1922, seventy-five different formulae of specially denatured alcohols obtainable only under heavy bond for use in manufacturing processes have been authorized in the United States. These formulae range in number from 1 to 47 inclusive and as high as five different formulae, all for the same general use follow the original numbers eq 38, 38A, 38B, 38C, 38D and 38E. According to the regulations each formulae must be used for the purpose for which it was authorized and before a manufacturer can obtain the same, a permit must be obtained and a heavy bond must be executed in duplicate, etc., etc.

No attempt will be made here to give the details of these seventy-five different formulae of the U.S.A. specially denatured alcohols. Such information is to be found in Appendix to Regulations 61 dated September, 1922 (Treasury Department, United States Internal Revenue). Formulae No. 1 should, however, be specially mentioned, and a few comments on the remaining formulae may not be out of place.

The composition of formulae No. 1; specially denatured alcohol is as follows:—

100 gallons of pure ethyl alcohol and
5 gallons of approved wood alcohol.

The number of uses for which this formulae is authorized in the United States is over 225 and ranges from artificial flowers and feathers, mirrors, paints, synthetic perfumes, photographic engravings, aspirin, tobacco, inks, chloroform and embalming fluids to paints, varnishes, shoe polish, motor fuel, various drugs and industrial chemical products.

The reason for the authorization of this formulae is apparently to allow the use of tax free alcohol for articles of commerce in the manufacture of which none of the six completely denatured alcohols is found to be suitable.

In Canada there is as yet no grade authorized similar to this U.S.A. specially denatured formulae No. 1. In great Britain, however, it will be noticed Grade No. 1—Industrial methylated spirits—is practically the same as formulae No. 1.

Formulae No. 4 of which the denaturing ingredients are nicotine, solution, yellow dye and brilliant blue dyes, is somewhat similar to the Canadian grade No. C. Its use is for cigars, cigarettes and other tobacco deodorant solutions.

Formula No. 5 composed of sulphuric ether, cadmium iodide and ammonium iodide (as denaturants) is similar to the Canadian grade No. 1A and is used for photographic purposes.

Formula No. 25 containing iodine and potassium iodide is similar to the Canadian Grade No. 1 iodine and is used for tincture of iodine.

Formula No. 46 containing phenol and methyl salicylate (oil of wintergreen) is the antiseptic and bathing alcohol preparation as compared to the Canadian Grade No. 1F containing brucine sulphate and diethyl-phthalate.

A partial list of the denaturants of the other formula for the U.S.A. specially denatured alcohols and the corresponding uses is as follows:—

Formula	Denaturants	Uses (List not complete)
2	Camphor and commercially pure methyl alcohol	Pyrolin and celluloid products
3	Castor oil, caustic soda, lye and pure methyl alcohol	Transparent soap and shampoo preparations
13A	Sulphuric ether	Anesthetic ether—dry food products, extracts—neosalvarsan, etc.
18	Vinegar (9% acetic acid)	Vinegar—acetone, etc.
23 and 23A	Acetone and benzol or acetone alone	Liniments and lotions for external use only
28 and 28A	Benzol or gasoline	Motor fuel
31	Soap and glycerine	Tooth paste
34	Tetrachlorethane	Artificial silk
38 and 38D	Methyl salicylate and zinc chloride or menthol and formaldehyde	Mouth washes and dentrifrices
40	Brucine sulphate and acetone	Perfumes and toilet preparations
44	Normal butyl alcohol	Varnishes, varnish removers, etc.
45	Refined shellac	Candy glaze

The above table is given mainly to show the general nature of denaturants used in these U.S.A. specially denatured alcohols. They are open to somewhat the same criticism as the denaturants used for the Canadian restricted specially denatured grades in that (a) very few of them impart to the ethyl alcohol with which they are mixed an offensive odor and (b) for very few can the claim be made that it is quite difficult to recover either or both the denaturant and original ethyl alcohol. Practically all, however, render the ethyl alcohol with which they are mixed poisonous, that is, when taken internally in quantities other than small doses. In general it may be said that the specially denatured alcohols appear to have been designed—and have the properties for special industrial purposes irrespective of their ability to meet all the non-potable requirements of a good denatured alcohol, whereas the completely denatured alcohols may be considered as having met both the non-potable and non-recovery requirements of a good denatured alcohol, irrespective of their adaptability for special industrial purposes. The objections both to the lack of offensive odor in respect to non-potability and to the comparative ease of recovery of the ingredients, of the

specially denatured alcohols are, however, met by the permit and bond, laws and regulations governing their use.

Summary comparison of the denatured alcohols authorized in Great Britain, Canada and United States is as follows:—

	Great Britain	Canada	U.S.A.
Total number of (tax free) grades authorized	3	10	81 (a)
(b) Number of completely denatured (tax free) grades sale unrestricted	0	3	6
Number of specially denatured (tax free) grades (sale restricted by permit and bond)	3	7	75
Number of grades using wood alcohol as sole denaturant As part denaturant	1 2	3 2	1 13 (c)
Number of grades not using wood alcohol	0	5	67

NOTES:—(a) One of these, viz.—formula No. 7 is reported as revoked and formula No. 1 substituted.

(b) Only the unrestricted grades are for the purpose of this table considered as completely denatured.

(c) The wood alcohol used in 13 part denaturant and 1 sole denaturant is comprised of both the regular approved quality and the commercial pure methyl alcohol. Out of the total of fourteen, 8 contain wood alcohol as per (approved) specifications and 6 pure methyl alcohol as part denaturant.

Industrial Alcohol for Motor Fuel

A grain alcohol product to be used as motor fuel is logically a denatured alcohol. There is as yet no special grade authorized in Canada for motor fuel purposes but there is apparently little reason other than price why for example unrestricted Grade No. 2 Pyridine should not be considered for motor fuel purposes. In the United States there are at present two formulae, viz.—28 and 28A containing 10% benzol and 1% gasoline respectively as denaturants, that have been authorized as specially denatured grades to be used in the manufacture of motor fuels. They are not used as such, but are apparently blended with such as ether and more benzol, gasoline, etc., before being offered for sale to motor (car) users. In Great Britain, as given above, the grade authorized for the manufacture of motor fuels is called "power methylated spirits" and is composed of wood naphtha, pyridine and benzol as denaturants.

The grain alcohol in these denatured alcohol grades used for motor fuels purposes is 190 U.S.A. proof and not less than 166 proof British that is 95.0 and 94.4% vol. respectively. A great deal of investigational work is being done on the use of 95% ethyl alcohol, benzol, etc. in variable compression internal combustion gas engines, the net result of which seems to be that the use of ethyl alcohol and benzol either used separately or mixed allows the development of high compression engines which development seems more or less restricted when using petroleum products and especially when trying to utilize more of the kerosene fractions along with the gasoline.

Results reported by Ricardo, see "The Automobile Engineer," August, 1921, show that the efficiencies for gasoline, benzol and ethyl alcohol do not vary much when used in a motor engine of comparatively low compression such as the automobile engines of to-day. On going to the "highest useful compression," however, 95% ethyl alcohol shows as high as a 25% increase in efficiency, benzol 17% and gasoline less than a 9% efficiency increase. These results would indicate that while at present ethyl alcohol and benzol are not more valuable per gallon for power purposes than gasoline, they may be worth more in the future.

Dates of Authorization of the Different Canadian Grades

Up to 1882 the denaturing of grain alcohol was in the hands of individual licensees. From that date up to 1920 the denaturing and sale of denatured alcohol was carried out at Ottawa by the Inland Revenue Department. During the early part of this period, four grades, viz.—No. 1 and 2 Standard, No. 1 Benzine and No. 1 Special were authorized, one unrestricted and three for restricted sale under bond. Up to this time all grades were known as methylated spirits. August 23rd, 1920, is the date on which authorization was given for the manufacture of denatured alcohol by licensed distillers in lieu of the Department. The number of grain alcohol distilling firms, so authorized at that time was nine, three in the Province of Quebec, five in Ontario and one in British Columbia. On September 30th, 1920, grade No. 2 Benzol was authorized for unrestricted sale, and this was followed on November 10th, 1921 by grade No. 2 Pyridine also for unrestricted sale. No. 1 Iodine was authorized November 20th, 1920, and its name changed to No. 1D, February 7th, 1922. No. 1A (ether and the iodides of cadmium and ammonia) and No. 1C (nicotine compounds) were authorized June 8th, and June 28th, 1921, respectively. The latest grade was No. 1F (rubbing alcohol compound) containing brucine sulphate and diethyl phthalate. This grade was authorized for restricted sale, February 15th, 1922, and was followed by certain additional restrictions as to sale on February 10th, 1923.

Comparative Selling Price and Cost Figures

For the purpose of comparing the prices of denatured alcohol in Canada, United States and also England, two grades will be selected as follows:—

QUOTATIONS PER IMPERIAL GALLON, DECEMBER, 1922

	Canadian	United States		English (Exchange $4.75)	
		U.S. Gals.	Imp. Gals.		
Completely denatured alcohol 10% wood alcohol 0.5 to 1% benzine	$1.00	$0.40	$0.48	2/7d.	($0.62)
Specially denatured alcohol containing as denat'nt 5% wood alcohol	No. Grade	$0.43	$0.52	3/6d.	($0.83)

The quotation for Canada it is to be noticed, is about double that in the United States, while the selling price in England is about six-tenths of that in Canada. Canadian quotations on industrial alcohol used for the manufacture of vinegar are about 80% of that for the lower priced denatured alcohols.

The price per gallon of the wood alcohol used as a denaturant is as a rule higher than the grain alcohol with which it is mixed and the fact that the specially denatured grade containing less wood alcohol is quoted (both in England and United States) at a higher price, raises the question as to whether the quality of the ethyl alcohol product used is better.

Factors given, as entering into the cost of denatured alcohol to explain why the Canadian prices are so much higher than those of the United States may be summed up as follows:—

(1) Higher raw material cost; higher freight and duty rates.

(2) Higher handling—sales—and distribution costs.

(3) Higher overhead costs—mainly higher capitalization per unit output.

The last named factor, viz.—higher overhead charges coupled with the necessity of distribution over a large sparsely populated area, as compared with the situation in the United States is noteworthy, but to investigate how much of the extra cost and selling price can be attributed to the above-

mentioned factors is beyond the scope and purpose of this paper.

QUALITY AND PRICE

In the refining of (industrial) grain alcohol from the mash what are known as "heads" and "tails" are produced, as well as high-grade ethyl alcohol. The heads will contain the lower boiling point organic impurities associated with ethyl alcohol produced by fermentation while the tails will contain the higher boiling alcohols such as fusel oil. A certain amount of the poor grade heads and tails are not marketable, while there is no apparent reason why those higher grades possessing good solvent, antifreeze and other properties should not be used in manufacturing denatured alcohol. The purest grade of ethyl alcohol is apparently used for making such as absolute alcohol and cologne spirits; and the alcohol to be denatured is known as "commercial grade." It will be this latter grade that contains the heads and tails and the amount and purity of these, will in turn determine the quality of the ethyl alcohol product going to make up the different grades of denatured alcohol. While no doubt the comparative demand for first, non-potable industrial alcohol (both undenatured and denatured) and second, the comparative demand of the different grades of denatured alcohol, will control the amount of more or less chemically impure, heads and tails used, it would seem that if more than one quality of commercial ethyl alcohol were feasible the less pure alcohol should be assigned to the general burning and antifreeze unrestricted grades and the best quality to the specially denatured alcohols to be used for special solvent and other manufacturing purposes.

Specially denatured alcohol U.S.A. Formula No. 1 calls for "pure ethyl alcohol." In England the quality of the ethyl alcohol used in their grade No. 1 methylated spirits is regulated apparently only by the special demands of the buyers in respect to quality. The general usefulness therefore of this grade of denatured alcohol containing only 5% wood alcohol and used extensively both in U.S.A. and England it would seem, depends on the quality of the grain alcohol used, as well as on the quantity and quality of the denaturant. This should be borne in mind when studying and comparing the industrial merits of any denatured alcohol. In Canada if users of denatured alcohol for special manufacturing purposes are unable by competitive buying to obtain the quality desired commercially pure ethyl alcohol is obtainable at excise duty rates ranging from fifteen cents to $2.43 per proof gallon, i. e. from twenty-five cents to $4.00 per gallon of 95% (vol.) alcohol. These rates, however, apply only for purposes specifically authorized and the undenatured alcohol is obtainable only by special permit and under bond according to rules and regulations of the Inland Revenue Department.

ETHYL ALCOHOL DISTILLATION INDUSTRY IN CANADA

Total Alcohol produced in Canada	Proof Gallons	Selling Value
1918—Whiskies and other spirits...	3,702,000	$2,782,000
1919—Potable and non-potable.. alcohol	2,057,000	1,250,000
1920—Potable and non-potable alcohol	3,308,000	2,802,000
1921—Potable and non-potable alcohol	4,026,000	.....

Total Industrial (non-potable) alcohol produced in Canada	Proof Gallons	% of total potable and non-potable alcohol produced
1919	1,777,000	86%
1920	2,223,000	67%
1921	1,347,000	33%

NOTE:—The proof gallon and selling value figures in the above table are from the Dominion Bureau of Statistics reports on the Liquor Distillation Industry in Canada for the years 1918 to 1921.

Estimate for the year 1922	Estimated percentage of total industrial non-potable alcohol produced	Estimated percentage of total potable and non-potable alcohol produced (1921 figs.)
Industrial alcohol taxable.....	60%	20%
Denatured alcohol tax free....	40%	13%
	100%	33%

The purpose of the above table is chiefly to indicate what percentage of the total ethyl alcohol produced in Canada is marketed as denatured alcohol. Of the total (non-potable) industrial alcohol produced, a reliable estimate is that 60% is used in the commercially pure state and is taxable while 40% is denatured and is tax free. These estimates are for the year 1922 and applying them to the 1921 production figures, it appears that, the total denatured alcohol sold in Canada represents approximately only 13% of the total ethyl alcohol produced. This figure will no doubt vary from year to year.

NEW BOOKS REVIEWED

"AN INTRODUCTION TO CHEMICAL ENGINEERING"

By A. F. Allen. Pitmans, Ltd., 70 Bond Street, Toronto. 270 pages. Price $3.00

This book has been prepared for the student in chemistry who is desirous of obtaining a knowledge of how operations in the school laboratory are carried out on larger scale in the industry.

The value of the chemist being recognised, he is now called upon to fill positions which before were taken by the engineer.

The student starting in the industrial world will find here a book providing considerable information and guidance in chemical engineering. While primarily for the student, the treatment is adequate for the experienced chemist and designer. A chapter on control of temperature is noteworthy in view of the operations and reactions which have to be carried in industry at definite temperatures. Up-to-date equipment and methods are fully described and covered by 177 illustrations.

The book is written in clear language, and the subject covered in an interesting manner for students and the users of chemical machinery.

"SPECIAL STEELS"

By T. H. Burnham. Sir I. Pitman & Sons, Ltd., 70 Bond Street, Toronto

194 pages. Price $1.50

This little book is chiefly founded on the researches and experience of that well-known metallurgist, Sir Robert Hadfield, and brings the large subject of steel alloys into a small compass.

Quoting from the foreword by Sir Robert, "The future march of civilization depends largely upon the scientific understanding, and handling, control of the qualities of the great and wonderful metal *Iron*".

In this book we are given an interesting review of the constitution and manufacture of the most important steel alloys, their characteristics and applications in industry.

A comprehensive bibliography is given. This is a book that should be owned by all workers in the steel field.

GOVERNMENT POSITION OPEN

Engineer, Mines Branch, Fuel Testing Division, Ottawa. Salary $2,100 per annum, increasing at rate of $120 yearly until a maximum of $2,580 has been reached. Duties: field investigation and laboratory research work in connection with the utilization of Canadian fuels. Education equivalent to graduation in science with specialization in mechanical engineering and with three years' experience in commercial or research work on the combustion of fuels. Applications must be filed with the Civil Service Commission, Ottawa, not later than June 21.

Mining and Metallurgy in British Columbia

(Special correspondence to Canadian Chemistry and Metallurgy)

Mineral Output for 1922

The Annual Report of the Minister of Mines for British Columbia, for the year ended December 31, 1922, was issued early in May, and shows that the value of the mineral production of the province for last year was $35,158,843, an increase of about 25 per cent. compared with the value of the production in 1921.

The following are the official figures of the mineral production for the last two years:

	1921		1922	
	Quantity	Value	Quantity	Value
		$		$
Gold placer.....Ounces	11,660	233,200	18,240	364,800
Gold lode..... "	135,633	2,804,154	197,856	4,089,684
Silver..... "	2,673,389	1,591,201	7,101,311	4,554,781
Copper.....Pounds	39,036,993	4,879,624	32,359,896	4,329,754
Lead..... "	41,402,288	1,693,354	67,447,985	3,480,316
Zinc..... "	49,419,372	1,952,065	57,146,548	2,777,322
Coal.....Tons	2,483,995	12,419,975	2,511,843	12,559,215
Coke..... "	59,434	416,038	45,835	320,845
Miscellaneous products "	.....	2,077,030	.....	2,682,126
		$28,066,641	.....	$35,158,843

With the exception of that given for lead production, the figures do not vary greatly from those predicted by your correspondent, early in the year. It is difficult to see how the Provincial Mineralogist arrives at the figure given for the lead output, which is approximately 20 million pounds less than what the preliminary report of the Mineral Production of Canada, issued by the Dominion Bureau of Statistics, credits to the province and 17 million pounds less than the lead output from the Trail smelter for last year. It is true, of course, that the Trail smelter received a considerable tonnage of ore from the State of Washington, but most of this was a dry silverore, containing insufficient lead to concentrate the silver in smelting. On the other hand, the Florence and Silversmith mines both shipped a large tonnage of concentrate to the Bunker Hill and Sullivan smelter, at Kellogg, Idaho, so the Trail output of lead should be appreciably less than the lead output of the whole province. Your correspondent is confident, therefore, that the lead output of the province for last year was in the neighborhood of 85,000,000 pounds.

Concentration of Fluorspar Improved

With regard to the less important minerals, the only production of iron ore made last year was 1,200 tons of magnetite, which was shipped from the Good Hope mine, on Texada Island. The Consolidated M. & S. Co. shipped 5,044 tons of fluorspar concentrate from its Rock Candy mine, the shipment realizing approximately $100,000. The concentration of the crude mineral has been markedly improved, the output averaging 88.5 per cent. of CaF_2 and 5.3 per cent. of SiO_2. Some 1,200 tons of magnesium sulphate was obtained from the waters of a lake near Clinton and refined in Vancouver by the Basque Chemical Company. The Lillooet Soda Company produced 1,300 tons of sodium carbonate, from lakes at Soda Springs, on the Cariboo road; the Hedley Gold Mining Company sold 571 tons of arsenious oxide, obtained as a by-product in the treatment of concentrate obtained from gold ore; and 2089 tons of pyrite was produced at the Sullivan mine and manufactured into sulphuric acid at Trail Building stone to the value of $154,593 was quarried in different parts of the province, and the value of the cement output was more than a million dollars.

Only Small Proportion of B.C. Prospected

The geographical distribution of the deposits from which the mineral output of the province was obtained is of particular interest. A map on the scale of 50 miles to the inch accompanies the minister's report, and if three silver dollars are placed on that map—one in the Fort Steele division, in the extreme southeast; one on the southern part of Vancouver Island, and the third on parts of the Portland Canal and Nass River divisions—they would cover places from which six-sevenths of the mineral production has been derived. This goes to show how comparatively small a part of the province has been prospected, despite the fact that the geological conditions over the greatest part of it are favorable for the deposition of one kind of mineral or another. The reason that so little of the ground has been explored is that the greater part of it is either covered by a heavy deposit of glacial drift, on which dense forests are growing, and, consequently can be explored only along the banks of the rivers and creeks, or else it is too inaccessible to tempt any but the most venturesome prospector. There is an immense area of practically unexplored land to the north of the Grand Trunk Pacific Railway, about which almost nothing is known. There are no roads, and journeys of one or two hundred miles over the tortuous trails take weeks to perform. Prospectors who have penetrated this wilderness have returned with tales of the discovery of an Elysian valley, some 300 miles north of the Grand Trunk Pacific, where ferns and grasses grow luxuriantly and dandelions are two feet high and six inches across, and where high-grade copper ore is to be found in immense bodies.

With regard to the copper ore, however, the prospectors are taken more seriously, as is evidenced by the fact that the Consolidated Mining and Smelting Company has recently purchased five claims on the Ingenika River, a tributary to the Finlay River, and 150 miles in a straight line from the nearest point on the G.T.P. railway. It is understood, too, that some of the Anaconda Copper Company's engineers are contemplating a hydroplane trip into this country this summer. This is the only practical way to explore this comparatively trackless wilderness, which if explored only by the old methods will remain a sealed book for another fifty years.

Driving Industries out of Business by Taxation

The Consolidated Mining and Smelting Company's annual report, which was issued recently, shows an operaitng profit of $1,228,329, after providing for interest on outstanding bonds, but not providing for taxes. In the latter connection Mr. J. J. Warren, the president of the company, makes a bitter arraignment against Canadian legislatures in general, averring that: "If the imposts levied for municipal, school taxes, and paternal legislation be added to the amounts shown in the statement, the grand total of such taxes for the year 1922 is more than one-quarter of the company's net operating profit". (For details of this company's report see Company News in Industrial Section of this issue.)

Granby Company's Report

The Granby Consolidated Mining, Smelting and Power Company's annual report shows that last year, after providing for general and administrative expenses and interest on bonds, the company made an operating profit of $808,100. When, however, provision for depreciation out of profits is taken from this it leaves a balance of only $26,311; and when a still further deduction for depletion, contingencies, and losses on securities is made, the balance sheet shows a deficit on December 31, 1922, of $738, 066. It should be borne in mind, however, that last year was a disastrous year for practically all copper producing companies. It was only at the beginning of this year that the price of copper showed any tendency to advance, while fuel costs have remained high.

The company charged into its furnaces and converters 849,079 tons of domestic and 29,524 tons of custom ore, and it produced 29,523,243 pounds of copper, 405,471 ounces of silver, and 6,996 ounces of gold. At its Cassidy colliery, on Vancouver Island,

the company produced 220,013 long tons of coal, of which 85,283 short tons was charged into the coke ovens, producing 55,732 short tons of coke, 5,446 tons of breeze, 1,580,520 pounds of ammonium sulphate, 86,357 pounds of concentrated ammonia, 433,946 imperial gallons of motor fuels and light oils, 520,841 imperial gallons of tar, and 885,846 thousand cubic feet of gas.

During the year a fresh survey and more conservative estimate was made of the company's ore-reserve, which is now placed at 8,955,990 tons of ore running two per cent. in copper, with the probability of adding to this amount on further development. Work has been commenced on a concentrator at Anyox, to cost $600,000, which will have a capacity of 12 to 15 hundred tons of ore per day. This when complete is expected to markedly cheapen the cost of production and allow of the working of a lower grade of ore.

Smelter Activities

The Consolidated Mining and Smelting Company has found it necessary to raise its zinc schedule to meet the increased rate of wages demanded by its smelter employees. Commencing March 16, when the price of zinc in London rises above 24:10:0, one fourth of the amount above that sum is to go to the smelters in addition to other deductions provided for by the scale. The smeltermen's wage scale increases also as zinc rises above the base rate of 24 : 10 : 0. The consolidated company is installing heavy crushing machinery at its Rossland mines, preparatory to the restarting of shipments to Trail, which it is expected will commence this month.

Granby Co. Secures Control of Canada Copper's Mines and Plant

The sale of the defunct Canada Copper Corporation's mines and plants at a registrar's sale on May 7, for $2,000,000, to G. L. Fraser, acting for T. H. Marshall, attorney for the Equitable Trust Company, of New York, and the confirmation of the sale by Justice W. A. McDonald, on May 18, thus vesting the titles to the properties securely with Mr. Marshall, have been quickly followed by the organization of the Allenby Copper Company, to take over the mines and plants from Mr. Marshall, and the transfer of 90 per cent. of the stock of the Allenby Company to the Granby Consolidated Mining Smelting & Power Company in consideration for 155,000 fully paid shares of the common stock of the latter company. L. R. Clapp, formerly assistant manager for the Granby Company at Anyox has been made manager of the Copper Mountain mine and Allenby plant. The mine will be reopened at once, and it is expected that it will be shipping concentrate to Trail before the end of July. The Granby company's directorate has been enriched by a group of powerful copper magnates, who formed the Allenby company; they are D. C. Jackling, August Hechscher, W. H. Coverdale, and H. G. Moulton. J. T. Crabbs, formerly executive vice-president of the Granby company, has been elected president.

With more capital at its disposal, the Granby Company evidently intends to branch out in other directions. Recently it has bonded the British Columbia Pyrities Company's property for $250,000. This property is situated on Red Gulch Creek, in the Skeena division. The Granby company had it under option for $200,000 in 1920, but after a large amount of diamond drilling the option was relinquished. It was stated at the time that an immense body of pyrite had been proved by the drill, but its copper content was too low to be worked profitably at that time, the tenor of the ore running 40 to 50 per cent. of sulphur, 0.5 per cent. of copper, and $1 per ton in gold. Mr. H. S. Munroe, manager for the Granby company, has announced that only work of a metallurgical nature, to determine the commercial availability of the ore, would be done this year.

J. A. Bancroft, professor of geology at McGill, will spend the summer at Anyox, endeavoring to extend the company's ore deposits.

ONTARIO'S NICKEL AND COPPER MINES' ACTIVE

Increased Activity Reported in Sudbury Area—Power Shortage Curtailed Gold Production During First Quarter of 1923

Returns received by the Ontario Department of Mines from the metalliferous mines, smelters and refining works of the province for the three months ending March 31, 1923, are tabulated below. For purposes of comparison the quantities and values are given for the corresponding period in 1922. Tons throughout are net tons of 2,000 pounds.

ONTARIO'S METALLIFEROUS PRODUCTION—FIRST QUARTER OF 1923

Product	Quantity 1923	Quantity 1922	Value $ 1923	Value $ 1922
			$	$
Silver.....Ounces	2,729,749	2,958,094	1,792,876	1,980,099
Gold..... "	213,263	226,176	4,373,513	4,675,475
Platinum metals..... "	20	.....	1,740	.....
Copper (metallic).....Pounds	2,872,540	22,553	460,441	1,310
*Copper in matte exported, Tons	549	5	109,875	897
*Nickel in matte exported, "	1,270	.....	507,836	.....
**Iron, pig..... "	.....	7,261	.....	178,530
Cobalt, metallic.....Pounds	84,639	21	205,459	75
Cobalt oxide..... "	135,923	75,505	268,241	157,906
Nickel oxide..... "	3,140,298	25	451,213	7
Nickel, metallic..... "	4,761,768	522,184	927,406	129,055
Nickel-cobalt compounds.. "	234,712	329,274	74,186	68,093
Lead, pig..... "	1,003,633	638,989	69,067	35,875
Total	.....	.....	9,241,853	7,227,322

*Copper valued at 10 cents in matte form and nickel at 20 cents in 1923.

**Total output of pig iron was 102,515 tons worth $2,745,605. Figures in the table represent proportional product from Ontario ore smelted.

Gold

Although Ontario's gold output for the first quarter of 1923 was exceeded by that of 1922, the reduction is entirely due to hydro-electric power shortage. The snowfall was light in the early winter, and all small feeders in the drainage basin were frozen solid. This situation followed by a late spring had the effect of greatly curtailing milling operations at Porcupine. Additional power from Sturgeon Falls on the Mattagami River and Indian Chute on the Montreal River will provide additional energy. Gold mining companies received a premium on exchange totalling $15,745.

Silver

Production for the quarter shows a small decrease from the 1922 figures, explained in part by the absence of shipments from Gowganda by the two leading producers, Miller-Lake O'Brien and Castle Trethewey. South Lorrain is producing at an increasing rate, the shipments from the Keeley and Frontier being 826,775 ounces of silver in addition to cobalt. The T. and N.O. Railway reports shipments of ore and concentrates as follows: to Ontario refineries, 523 tons and 247 tons to the U..S. The average price of silver for the quarter was 65,845 cents per ounce as compared with 65,06 cents in 1922. Mines shipping over one-quarter million ounces follow in order; Nipissing 910,980 ounces, Keeley 530,174 ounces, Mining Corporation 310,697, Frontier 296,601, Coniagas 268,374. Mines report payment for 132,222 pounds of cobalt. Details of silver output are:

Cobalt, South Lorrain, etc....	2,685,077 ozs.	Value	$1,763,522
Recovered from gold refining..	33,321 "	"	21,885
Recovered from nickel-copper refining.....	11,351 "	"	7,469
Total...	$2,729,749 "	"	$1,792,876

Refineries: Southern Ontario silver refineries at Deloro and Thorold treated 1773 tons of ore, concentrates and residues during the quarter. Nickel-cobalt compounds include unseparated oxides and residues marketed. Production of nickel oxide and metallic nickel is insignificant as compared with the output from nickel-copper refineries. In addition to the items noted in the table, 660 tons of white arsenic worth $154,069 were marketed, the Deloro company operating a plant for the manufacture of insecticides.

Nickel and Copper

Production from the Sudbury area is on the increase following the post-war depression. The Mond Company has a plant at Clearfield, Pa., for the production of malleable nickel, and the International Company now operates at Huntington, W. Va., a rolling mill for nickel and monel metal products. The industrial uses of nickel are rapidly expanding. In April an announcement was made that mine, smelter and refinery of the British America Nickel Corporation would be soon placed in operation after a prolonged shut down. During the period the Mond and International companies smelted 192,118 tons of ore and produced 10,748 tons of nickel-copper matte. The Mond Company made no shipments, but the International shipped 2,271 tons of matte to Huntingdon, W. Va., and 6,324 tons to Port Colborne, Ont. At the latter plant 6,764 tons of matte were treated. The price of electrolytic copper on the New York market averaged 15.56 cents on the pound for the period as compared with 12.96 cents in 1922.

Iron Ore and Pig Iron

The only iron ore shipped during the period was a consignment of 307 short tons of briquettes by Moose Mountain, Limited, to Welland, Ontario. No Ontario ore was smelted in blast furnaces, consequently the province is not credited with any pig iron production in the table. The Steel Company of Canada had a considerable tonnage of Moose Mountain briquettes on hand at the end of the quarter to be smelted later in connection with the experiments being conducted by the Ontario Iron Ore Committee.

During the quarter two blast furnaces at Sault Ste. Marie and two at Hamilton were operated. In the month of April another stack at Sault Ste. Marie was blown in, also one at Port Colborne. Foreign ore totalling 194,091 short tons was smelted, the output of pig iron being 102,515 tons worth $2,745,605. In steel making 62,241 tons of pig were used and 66,459 tons of scrap iron were used for the production of 115,967 tons of steel, valued at $4,114,074.

Lead

The average New York price for pig lead was 7.98 cents per pound as compared with 4.71 cents for the corresponding quarter in 1922, and there was an increase in output as noted in the table. Early in the year the Kingdon Mining, Smelting and Manufacturing Company at Galetta on the Ottawa River placed in commission a new blast furnace for the treatment of slags and flue dust which had accumulated from Scotch hearth smelting of lead concentrates. The Company is now in a position to handle customs ore.

World Wide Chemical News

(Special Correspondence to Canadian Chemistry and Metallurgy From Ou London Representative)

Italian Rosin.

Professor Facchini has been engaged for some time on the problem of distilling the wood from coniferous trees. Italy imports rosin largely from France, Spain and the United States, the value of imports reaching about 40,000,000 lire per annum.

Fixed Nitrogen Industry in France.

Great controversy has been aroused both in France and Germany by the adoption of the Haber process of manufacturing fixed nitrogen by the French Government. At the request of the French Government the Academy of Science appointed a committee in February, 1921, to report as to the best process available, and although this report has been kept generally secret, it is known that they found the "Claude" and "Haber" processes offered more or less equal advantages. The French "Claude" process is now working at Montereau, producing about five tons of ammonia per day without difficulty, and it is claimed by many chemical engineers that this is superior to the "Haber." A number of other processes, particularly the "Casali," have also done well, and in view of the great importance of fixed nitrogen to the world in general, it is to be hoped that the report of the Academy of Sciences will be made public, and that no undue preference will be given to any one process.

Belgian Glass Industry.

Belgian exports of plate glass totalled 28,000 tons during the first three-quarters of 1922, the best customers including the United Kingdom, the United States, Canada and Argentina. The improvement which began to be noticeable in the early part of the year became more and more marked until in October output was 75 per cent. of the total productive capacity. The exchange crisis which occurred then further strengthened the position, so that exporters now have difficulty in coping with the demand.

The entire production of window glass is now in the hands of 18 companies, which possess 33 furnaces. Exports for the first nine months of last year reached 116,000 tons.

The annual productive capacity of Belgian bottle factories is now 40,000,000 bottles, of which quantity the domestic market absorbs 25,000,000, the production being done by mechanical processes. During the course of the year work on an important new factory, equipped for the Libby-Owens process, was finished, and the first furnace was lit in July last. In the bottle branch of the glass industry Belgium is a large importer from Germany, Czecho-Slovakia, Belgium, the United Kingdom and elsewhere.

German Potash Industry Restricting Operations

The "Deutsche Bergwerks Zeitung" states that a number of potash works in Central Germany have been compelled to restrict work owing to unfavorable sale conditions. The internal demand has been hard hit by recent events in the Ruhr, and export sales do not recompence for the loss of this trade. The potash business with America has not fulfilled expectations, and undercutting by Alsatian works is reported.

German Coal Oil Products Company.

A new company has just been floated with a capital of 75,000,000 marks for the exploitation of the Bergin system of oil extraction from coal. The new works are at Rossleben, and the concern—which is styled the Rossleben Bergin Company—has been founded by the Gesellschaft fur Teerverwertung (Coal Tar Company), the Riedel Company, the Erdol und Kohlenverwertungs Gesellschaft (Oil and Coal By-Products Company, and the Gesellschaft fur Petroleum-Industrie.

German Nitrate Fertilizers.

While official prices for nitrate fertilizers have in the past been fixed according to cost of production, they are now largely determined by the exchange value of the mark and the price of Chile saltpetre. They were recently reduced by about ten per cent.

New German Calcium Nitrate Plant.

The Stickstoff Actiengesellschaft, which belongs to the Bayerische Stickstoffwerken A. G., of Munich, and is an Austrian company working with German capital, is about to construct important works for the production of calcium nitrate at Gollingen, between Salzburg and Berchtesgaden. The company will utilize chalk from the neighboring quarries, native peat coke, nitrogen from liquid air, and will obtain electric power from hydraulic forces which can be utilized in that region.

Industry and Trade

Industrial Developments---Trade and Company News---Financial Notes---Patents ---Market Review and Prices

INDUSTRIAL DEVELOPMENTS.

North Bay, Ontario.—The British American Nickel Corporation has re-opened its mine and smelter works which has been closed for over two years. This company has two furnaces with an ore capacity of 1,200 tons per day and a matte production of 35 tons. Seven hundred men will find employment.

Winnipeg, Manitoba.—A larger increase in the production of dairy products than any previous year in Manitoba's history was recorded during the past year. according to the annual report of the Dairy Commissioner of Manitoba. The total value of dairy products. in 1922, was approximately $12,434,223. The production of creamery butter, reported by the 44 creameries, amounted to 10,559,601 lbs., which was 2,009.496 pounds more than in 1921, and the selling price at the creameries was $3,695,860.

What is believed to be the first electric smelter plant in Winnipeg is being installed by the Vulcan Iron Works to manufacture certain products, according to F. A. Cambridge, city electrician. The plant will commence operations at an early date.

Saskatoon, Saskatchewan.—The Quaker Oats Company here proposes to erect eight additional grain tanks which will mean 250,000 bushels added to its storage capacity. Cleaning and drying equipment is also to be installed. The new improvements will involve an expenditure of about $100,000.

Medicine Hat, Alberta.—The Alberta Clay Products have received orders from two British Columbia points. which it is expected will run to about fifty cars. It is understood that the Canadian Farm Implement Company intends erecting a plant in the city during the summer.

Local flour mills are securing extensive orders for their products from foreign countries. The Lake of the Woods mill has an export order for 72 tons of flour for Great Britain; the Ogilvie Flour Mills has a substantial order for Japan; whilst the Hedley Shaw mill is shipping fifty tons to Japan and 30 tons to San Francisco.

Regina, Sask.—Government men are supervising extensive drilling operations at one of the Province's largest clay deposits for the purpose of obtaining samples for British interests who are considering developing the deposit. Should the samples prove satisfactory the development would mean a considerable extension to the pottery industry of Western Canada.

Thetford.—Activities at the Thetford (P.Q.) asbestos mines appear to be increasing. Shipments for the month of March showed an increase of 4,399 tons, compared with the previous month, and an increase of 5,320 tons over the corresponding month last year.

Vancouver.—Reorganization of the Western Canada Pulp and Paper Company's plant on Howe Sound, B.C., is under way, and two companies have been formed to take over the assets of the concern. The Howe Sound Pulp and Paper Company will have control of the pulp and paper mill, about 12 miles from Squamish. The timber limits on the north end of Vancouver Island have been taken over by the Port McNeill Timber Company, Limited.

The $15,000 condensory of the South Sumas plant of the Borden Milk Co. is again in operation. Mr. J. D. Murray, the new manager, has had over twenty years experience with the Borden Co.

Newcastle.—The Westmoreland Chemical Co. is enlarging its plant at Newcastle, Ont., and work formerly done at the company's Philadelphia plant will be handled there.

Montreal.—A $1,500,000 plant is being built in Montreal by the Portland Cement Co., a subsidiary of the National Cement Co., of Fall River, Mass.

Port Colborne, Ont.—After a period of idleness. the Maple Leaf Milling Co., at Port Colborne, Ont., is to resume the manufacture of flour, this month. Their plant has a daily capacity of 20,000 bushels.

Hamilton, Ont.—The Procter & Gamble Mfg. Co. are enlarging their plant at Hamilton, Ont.

Chippewa, Ont.—The Norton Co. are enlarging their electric furnace plant at Chippewa, Ont.. adding a furnace building 70 x 150 feet, which will be used for the manufacture of carbide of silicon abrasive, known as Crystolon.

New Westminster, B.C.—The Triangle Chemical Co. have erected an addition to their plant at a cost of approximately $25,000, for the manufacture of pure red oxide of copper. Epsom Salts from B.C. magnesite will also be made.

Greenfield, Ont.—The H-O. Cereal Co., Inc., are operating their new mill at Greenfield, Ont. Complete milling equipment for the manufacture of Force whole wheat flakes has been installed, and the daily capacity of the mill is now 14,400 packages.

Hamilton, Ont.—The Beech-Nut Co. of Canada, Ltd., have opened their chewing-gum factory, at Hamilton, Ont. The building contains 25,000 square feet of floor space, and is modern in all respects. As yet, chewing-gum is the only product being manufactured, but it is probable that new lines will be produced in the future, as the parent company, the Beech-Nut Packing Co., Canajoharie, N.Y., make over fifty food and allied products.

Grand Forks, B.C.—Local business men and ranchers in and about Grand Forks, B.C., have opened a plant under the name of the Fruit Products Co., to manufacture apple butter, apple syrup, apple cider and cider jelly, from apples for which there was no market in the fresh form.

Lethbridge. Alta.—Gasoline, kerosene, distilled and possibly gas oil are to be manufactured by the Dominion Refiners, Ltd., at their new plant at Lethbridge, Alta., which is being erected at a cost of $100,000, and which, when in operation, this month, will be able to handle as much as 500 barrels of crude oil daily. The U. S. Petroleum Co. of Montana, in which this company has a controlling interest, will supply the refinery at Lethbridge with crude oil.

Toronto, Ont.—The head office and plant of the Pyrene Mfg. Co. of Canada. Ltd., manufacturers of fire extinguishers, anti-freeze compound for automobiles and non-inflammable cleaning fluid, have been moved from Montreal to 1197 King Street W., Toronto. This company expects to manufacture other various safety devices, allied to their present products.

It is reported that the Hollingsworth-Whitney Corporaton, pulp and paper manufacturers of the United States, have purchased large tracts of land and secured water-proof rights at St. Stephen, N.B., and will erect a pulp and paper mill there.

SEMET-SOLVAY ESTABLISHES PLANT AT HAMILTON.

It is expected that the plant of the Hamilton By-Products Coke Ovens Co., Ltd., Hamilton, Ont. (the total cost of which will be about $200,000), will be in operation by November 1st. The minimum daily capacity of the plant will be 5,000,000 cubic feet of gas. and the maximum daily capacity 7,000,000 cubic feet. From 300 to 350 tons of coke will be obtained daily, as a by-product. This will be a Semet-Solvay plant, and will be a distinct addition to the long list of plants of this company in the Eastern States. The significance of the development at Hamilton is indicated by the fact that this company is the largest producer in the world of refined products from the distillation of coal. These include, besides all grades of coke, various ammonia products, light oils, benzol and tuluol, tar products; and Canada offers both a domestic and export market for ammonium sulphite and coal tar products. while the coke market itself is not likely to decrease.

CHARLES A. ROSE APPOINTED GENERAL MANAGER BRITISH-AMERICAN NICKEL CORPORATION.

A reorganization of the British-American Nickel Corporation has been made, preceding the recent resumption of operations. Mr. E. J. Carlyle has resigned as manager of the smelter at Nickelton, and Mr. Charles A. Rose has been appointed general manager for the company.

Mr. Rose comes to his new position with seventeen years' experience gained in chemical and metallurgical engineering at some of the United States' largest mills. Following his graduation in science from the University of Nebraska, he entered upon an active career as chemist and metallurgist. For six years he was chief chemist for the Boston and Colorado Smelting Company, at Denver, and after serving for two years as metallurgical engineer for the American Smelting and Refining Company, he became consulting metallurgist to the Guggenheim Brothers, the Chile Exploration Company, and the Braden Copper Company, and assistant to Vice-President E. Cappelin Smith. of these companies. In coming to his present position with the British-American Company, he resigned as assistant to Mr. Smith, but still retains his position as consulting metallurgist to the companies mentioned.

Owing to the depressed state of the nickel and copper markets during the past two years the plant at Nickelton has been idle. It is no easy task that now confronts Mr. Rose—that of practically reorganizing the whole producing end of the business and the introducing of the very latest processes. Production is expected to total 10,000 tons of nickel ore and 5,000 tons of copper annually. His success attained in American mills would seem to auger well for Mr. Rose's efforts at Nickelton, and the results will be watched with interest by Canadian metallurgists.

The total value of shipments of the various products of the American Cyanamid Co., Niagaara Falls, Ont., for February, 1923, was $676,169. Sales during the same month amounted to $940,000.

EXPOSITION TO SHOW EQUIPMENT CHANGES

Some chemical manufacturers are to-day using the same equipment which was in operation long before the war. While statistics are reputed to show that the average life of machinery and equipment in the American chemical industry averages about fifteen years, reports indicate that it has been the custom of manufacturers in Germany to renew equipment, that is the large proportion of their equipment, about every five years. This practice became common in Germany some years ago, after the experience of a few manufacturers proved that along this line lay greater efficiency, cheaper operating costs, and greater yields. At the Ninth National Exposition of Chemical Industries, which will be held this year at the Grand Central Palace, New York, during the week of September 17th to 22nd, the progressive tendency in the chemical equipment field, a development which has taken place largely during the past six or seven years, will be demonstrated.

Although there is a distinct progressive element in the chemical industry in the matter of new ideas in machinery, equipment and the like, the greater portion of the industry is accused of being willing to "let well enough alone" so long as the equipment functions as it has for some years past. Each year has seen rapid strides made in the building of chemical plant apparatus in America, and each successive Chemical Exposition since 1915 has seen numerous new devices and types of equipment on exhibition. Each exposition has been a step in the gradual evolution of what is practically a new line of chemical machinery. Devices which were first offered as something new and novel at the 1915 and 1916 Chemical Expositions have, in numerous instances, become practically obsolete to-day. Machinery which five or six years ago was considered the last word in chemical equipment, is in a few cases no longer sold, owing to the fact that something better has taken its place. New machines and devices are being brought out each year, improvements on old types of equipment are being developed regularly, and the chemical equipment problem for this reason becomes an ever-changing one. No Chemical Exposition has ever gone by without this condition being ably demonstrated by the number of new devices shown.

According to several leading technologists, Germany's position in the chemical world prior to 1914 was due to a great extent to the fact that improvement in equipment were made to keep pace with improvement in quality of products, and better technique and efficiency. The same developments in the American industry which have brought it to the fore during the past five years, including hundreds of new and improved products of a chemical nature and the various types of equipment to meet the needs of this expansion will be shown at the 1923 Chemical Exposition in New York.

This year's Exposition will show that progress on a broad scale in both the chemical and chemical equipment industries has taken close to five years to get under way in full force, and that the movement during 1918-1923 was merely a small beginning.

J. Ford & Co., Portneuf, P.Q., have erected a two-storey concrete and steel building, in which they are installing a new 120-inch cylinder paper machine, for the manufacture of roofing felt and other heavy papers. The company expects to have it in operation by August, and the daily output is estimated at 2[illegible] tons.

IN THE PULP AND PAPER INDUSTRY.

A. H. Kendall, master mechanic of Quebec District, Canadian Pacific Railway, has resigned from this company's service, having been appointed manager of the Chicoutimi Pulp Co., the Saguenay Light and Power Co., and the Roberval and Saguenay Railway Co.

The Anglo-Newfoundland Development Co., in maturing their plans for new developments in connection with pulp and paper manufacturing in Newfoundland, have acquired the property and plant of the Terra Nova Sulphite Co. at Anglo Brook, Cloverton. This concern was started years ago by Messrs. Blackstad and Storm for the purpose of making sulphite pulp and paper.

According to statistics recently issued by the Australian government, Canada tied with Sweden for second place in the list of countries selling paper to Australia in 1921. The Australian paper imports for the year ended June 30, 1921, were: From Great Britain, $8,672,000; Canada and Sweden, approximately, $5,400,000 each; United States, $3,760,000; Norway, $3,260,000.

Sulphite Fumes Delay Navigation.

Fumes arising from the pulp and paper mills in the vicinity of Three Rivers caused a delay of two hours to the Canadian Pacific liner Minnedosa when she was going up the river to Montreal, and brought a vigorous complaint from her master, Capt. Horatio Sibbons, when he reached Montreal. There have already been several similar complaints and the Naval Department in Ottawa is investigating the matter in co-operation with the technical staff of the mill which is accused of causing the trouble, the Wayagamack Pulp and Paper Co.

The Des Quinze Power Co., a subsidiary of the Northern Canada Power Co., was the successful bidder for the lease of the Des Quinze waterfalls. The lease is for a period of 60 years, the annual rental to be $80.100, in addition to this a royalty of 50 cents per horsepower will be collected on development and an additional one of 50 cents on exportation to Ontario and the United States. Expectations are that in the fall of 1924, 20,000 horsepower will be available.

Paper Companies Increase Wages.

The recent increase in wages recently granted by eleven of the large paper companies to all classes of labor practically eliminates all possibility of labor trouble in the industry for this year. In spite of the consequent increase in cost (about $20,000 a day for the companies having signed the agreement) the Canadian companies have decided to make no increase in the present contract price for newsprint, which is $75 a ton. Some time ago the International Paper Co., the largest producer of newsprint in the world with a daily output of about 1,000 tons, had intimated that there was a strong possibility of an advance of the contract price to $80; but it has now decided that the present price will remain unchanged until the end of the year. The decision is more momentous than may appear on the surface, and means that the newsprint industry is gravitating to Canada at an increasingly rapid pace. Recently published figures show that in 1913 the United States imported 15% of their consumption of newsprint, while in 1922 they imported 44%, of which Canada supplied 87,% or 896,312 tons.

The Canadian National Ry. has made arrangements for the inauguration, on June 1st, of a new fast freight service especially for Canadian newsprint between Montreal and New York. It is planned to be so speedy that it will be possible for Canadian newsprint to be shipped from Shawinigan Falls or Grand Mere one day and be turned out from the New York printing presses with the latest news three days later.

Quebec Paper For France.

Henry Rolland, connected with the J. B. Rolland Paper Co., has practically completed arrangements for the organization of a company which will work in France to sell Quebec pulp and paper to French houses. It is calculated that with the substantial reduction in duty accorded in the recent French treaty, which gives Canada the minimum tariff, there are opportunities for big business with France, and it is hoped to compete successfully against the Scandinavian pulp and paper producers.

C.P. and P.A. Endorse Government School.

The Council of the Canadian Pulp and Paper Association has endorsed the establishment of a paper-making school by the Quebec Government, and have appointed the following committee to co-operate with the Lands and Forests Department: Messrs. G. Carruthers, J. A. Bothwell. F. A. Sabbaton, J. Stadler, C. R. Whitehead, J. N. Stephenson and E. Beck. The Council have also endorsed a resolution of the Canadian Lumbermen's Association requesting the Dominion Government to enact permanent legislation allowing the manufacture and sale in Canada of oleomargarine. They have decided to send the Government a protest against the proposed removal of the Forest Products Laboratories from Montreal to Ottawa.

Blotting Paper from Wood Pulp.

An entirely new departure in the manufacture of blotting paper is forecast by the Forest Products Laboratories of Canada, Montreal, as a result of an investigation recently carried out in their experimental paper mill. The best grades of blotting paper have, hitherto, been made from rag pulp, but the laboratories have succeeded in producing a paper with excellent absorptive qualities entirely from wood pulp. The interesting feature of the new paper is that it contains a large proportion of pulp made from a wood which, although plentiful, has found little employment in the pulp industry of Canada.

More Barnjum Forestry Prizes Awarded.

Prizes have been awarded in the Barnjum $2,000 prize contest for the most convincing arguments in favor of prohibiting the export of unmanufactured wood from Canada, as follows:—First prize, for the best essay in English, $500, went to J. R. Black, Ottawa. Second prize, $250, to J. R. Dickson, Dominion Forestry Branch, Ottawa. Third prize, $150, to H. C. Scott, Pointe Claire, P.Q. Fourth prize, $100, to Fred. Barnes, Belgo Paper Co., Shawinigan Falls, P.Q. For the best essay in French, $500, went to Avila Bedard, Quebec. Second prize, $250, to Albert Trempe, Quebec. Third prize, $150, to Eugene Rivard, Quebec. Fourth prize, $100, to Henri Roi, Belgo Paper Co., Van Bruyssel, P.Q.

Riordon Developments.

It is learned on good authority that Montreal financial interests who have been identified with the Riordon Co. have made an offer to provide $10,000,000 for the rehabilitation of the company, and that this offer will be shortly presented for the approval of the shareholders of the country. It is understood that the proposal provides for the offering of the greater part of such new financing to the present shareholders in a manner which would preserve them the control of the company. There is a cash investment in the properties of over $20,000,000 in excess of the new bonds. The company has about 3,000 shareholders. The new financing would provide for the payment of all bank loans and claims of secured credi-

tors, while the unsecured creditors would be asked to accept stock in the company for their claims, without there being any suggestion, however, of an assessment, and, it is claimed, leave the company with a working capital of five to six millions.

International Paper Co. Output.

The output of the International Paper Co.'s mill at Three-Rivers is now running at about 265 tons a day, an addition of nearly 80,000 tons to the Canadian production since the middle of last year. The company is planning to instal a seventh grinder unit and a third sulphite digester to enable capacity production to be attained.

Back River Power Developments.

Arrangements are well on the way to completion for the construction of a 45,000 h.p. dam and power plant on the Back River between the Island of Montreal and the mainland. J. R. Walker, of the Back River Paper Mills, Montreal, and other parties are working out the details. There is at present a small power development on the spot, which provides power for the paper mill, up to 1,200 h.p. at some seasons of the year. The river divides at the point where the larger development is planned, and the new dam, it is expected, can be made to produce 45,000 to 50,000 h.p.

It is anticipated the cost of the dam and plant will be about $6,090,000, while, with allowances for damages and other costs, the company is likely to require close to $8,000,000. This works out at around $150 per h.p., which is very high, but in this development there will not be expensive installations for transmission lines, transformer units., etc., which must be installed in most power schemes. The dam will be practically within the city of Montreal.

Wages Raised in the Paper Industry.

Eleven Canadian and United States paper manufacturers, producing nearly one-half of the news print consumed in the United States, have signed an agreement with union representatives of their employees increasing wages for all classes of labor five cents an hour. The agreements are for one year, beginning May 1, 1923, and affect over 50,000 men.

CONDITIONS IN THE ASBESTOS INDUSTRY.

At a meeting of the Ashestos Corporation of Canada, Ltd., held at Montreal on April 26th, President W. G. Ross brought out some interesting points concerning the industry in general. Conditions in Europe have been very unsettled and the situation to-day has not improved. Shipments are relatively small. Most of the overseas manufacturers are not running their plants, and those who are are operating only a few months in the year. In England, France and Belgium there is more activity than in Germany and Austria; but the former countries are purchasing a considerable portion of their requirements from Rhodesia, which is a keen competitor in certain grades of Canadian asbestos. Russia is again commencing production and entering the market to a limited extent. The basis of wages paid for labor at present in Russia is $7 a month, in Rhodesia 30c a day, and in Canada $3 a day. Last year Canada exported 176,340 tons of asbestos, valued at $6.058,171, and the previous year 84,475 tons, valued at $5,199,789. The reduction in prices is due in some measure to the accumulation of large stocks of asbestos in Canada, and therefore forced sales have been made by various companies, some of which have been under finarcial pressure, so that the prices now realized are lower than the average prices of last year.

The strike of the employees of the Asbestos Corporation of Canada at Thetford Mines, Que., ended when the miners returned to work on the 30th of April. The grievances of the men are having the attention of the officials of the company and the prospects are that a permanent satisfactory agreement will be reached in the very near future.

J. A. Jacobs, president of the Black Lake Asbestos Co., takes a rather encouraging view of the asbestos industry in this country. At the present time business is better than at any time since 1920, the company is behind in filling orders, and thus far this year there has been improvement estimated by him at 100 per cent. The Black Lake Co. do over half their business in low grade asbestos, and in this commodity there has been an advance of nearly 25 per cent. in price, which, combined with the greatly increased demand, gives reason for the prevailing optimism as far as Mr. Jacobs is concerned. High grade asbestos is now being produced here at a cost to more than meet the price of the Rhodesian product, and it is only in the high grade field that Rhodesia is a factor.

MANY UNIQUE FEATURES TO NEW LINE OF CANADIAN-BUILT STEAM-DRIVEN AIR OR GAS COMPRESSORS

A new line af steam-driven air or gas compressors, ranging in size from 67 to 1,083 cubic feet piston displacement per minute, has recently been placed on the market by the Canadian Ingersoll-Rand Company, Limited, 260 St. James St., Montreal.

These machines, known as the Class "FR-1," are of the steam-driven companions of this company's Class "ER-1" belt-driven compressors, and, like the latter, are of the single stage, straight-line centre-crank enclosed dust and dirt-proof type, with automatic lubrication of both running parts and compressing end.

They embody every refinement of modern compressor design, including a number of features which make them as nearly automatic in action as any machine of this type can be expected to be. This is an important consideration in any compressor, but is even more essential in the case of small and medium-sized units which are often operated in isolated locations where but little attention can be given them. For this reason the Class "FR-1" compressors are recommended for use in industrial plants, small mines, quarries,, contract jobs, foundries, machine shops, etc, as well as for use as auxiliaries in large air power plants.

In general the Class "FR-1" Compressor consists of a plate valved compressing cylinder direct-connected to steam engine with balanced piston valve and automatic cut-off control, a design which makes it possible to operate with high pressure and superheated steam, as well as the moderate pressures more common in the past. This feature alone ensures a steam economy at all pressures not heretofore attainable.

The main frame, as previously mentioned, is of the enclosed type, the bottom part of which forms a reservoir for the combined splash and flood lubrication system. It is fitted with removable side and crank end covers, which are not bolted on, but are retained by lips on the frame casting. Removal of these covers permits inspection or adjustment of all running parts. The crosshead guides are of the bored type and the design of the frame provides for an oil stuffing box near the cylinder end of the frame, which prevents any chance of crank case oil entering the compressing cylinder when the machine is unloading. Openings in the cylinder end of the main frame and in the trunk piece interposed between the steam and air cylinders provides for adjustment of all stuffing boxes when the machine is running.

The main frame and trunk piece are mounted on a substantial cast-iron sub-base, which lends rigidity to the entire structure, makes the machine a complete self-contained, accurately-alligned unit, and also forms a support for the single rocker arm which guides the valve rod.

There are no guide blocks or other sliding surfaces in the piston valve gear.

The main bearings are of very heavy construction and are provided with removable die-cast shells or liners of genuine babbit metal, which can be removed and renewed in a few seconds at small cost. Due to the area of the bearings and the complete circulation of oil through them at all times, however, the shells last for very long periods without appreciable wear.

The crank-shaft and connecting rods are solid one-piece drop forgings, accurately machined and heat-treated. The connecting rod is of the solid-end type with renewable and adjustable boxes in both cross-head and crank-shaft ends. The cross-head is of the cylindrical type, of box construction with adjustable bored and turned shoes.

Pistons are of the box type, with broad faces, and are securely fastened to a turned and ground steel rod.

Oil is distributed to all of the running parts by throwers of the crank webs, which lift or throw the oil against baffles, from which it runs to all wearing surfaces.

Another feature of these machines worth attention is the ease and rapidity with which they can be converted to belt-drive or used as a combined belt and steam-driven unit. Due to the extent of hydraulic electric development in Canada, it sometimes happens that local conditions may make it advisable to change over to motor-drive or to use a combination of the two for stand-by purposes. This can be more readily accomplished on these machines than on any similar type.

Bulletin K—312, describing these machines, may be secured from the company.

NEW BOOK ON ELECTRIC HOISTS

The Link-Belt Company has recently issued a very comprehensive and instructive book on "Electric Hoists and Overhead Cranes." It is not only profusely illustrated with photographs of actual installations showing some of the most recent Link-Belt Electric Hoist applications, but with line and wash drawings. The subject of proper installation and efficient operation is fully covered. Going further than the usual "catalogue," this new book tells, in print and picture, of the practices and methods employed by users in widely divergent fields. Copies of the book—"Book No. 480"—are obtainable from the Link-Belt Company's Toronto or Montreal offices.

ELECTROPLAX, LIMITED

The Electroplax, Limited, of Mount Dennis, Ont., which was destroyed by fire last November, has been re-established at 163 Dufferin St., Toronto.

Although they are not yet producing to capacity, they are in the market to supply phenolic condensation varnishes. The cold moulding presses will be in operation about the middle of this month. The company does not propose to press any hot moulding pieces for a period of six or eight months.

The president of the company is Mr. V. R. Smith. The general and sales manager is Mr. W. M. Davidson.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Rendering Stable Alkaline Solutions Containing Active Oxygen.—A. Schaidhauf, 230,967, May 8, 1923. Alkaline solns. containing active O are stabilized by the addition of a colloidol mg. compd or a colloidal combination of MfO and SiO_2.

Metallurgical Process.—W. E. F. Bradley, 230,928, May 8, 1923. Where ores are reduced with a hydrocarbon gas the H may be removed from the molten metal and the latter carbonized by the addition thereto of a mixt. of the metal oxide and free C, the C. being sufficient to reduce the metal oxide from CO, which removes the H and the excess C will carbonize the metal.

Electrical Furnace.—W. E. F. Bradley and A. B. Bradley, Can., 230,927, May 8, 1923. The furnace has its main axis inclined and has a door and a tempero both removed from the main axis and means for rotatably supporting the furnace. The symmetrically arranged electrodes terminate above the charge, are inclined toward a common axis and have individual feed devices controlled by the current passing through the respective electrodes for maintaining their ends at equal distanec from the common axis.

Iron and Steel—W. E. F. Bradley, 230,926, May 8, 1923. A hydrcarbon gas is passed through the molten ore in an electric furnace, the continuous supply of ore to the furnace is interrupted at intervals for discharging the reduced product.

Apparatus for Producing Iron and Steel.—W. E. F. Bradley, 230,924, May 8, 1923. The app. consists of an elec. furnace with suitable electrodes, having a carbon twyere independent of the electrodes and so disposed as to be covered by the charge in one position of the furnace and removed therefrom in another and means for supplying reducing gas to the twyere.

Extracting Zinc from Its Ore.—E. A. Johansson and G. J. Eklund, 230,923, May 8, 1923. The ore charge is caused to slide along a spiral path in a shaft above the furnace to causc agitation and the ore is heated by the gases from the furnace.

Rendering Chlorides of Ketone Soluble by Means of Alkalies.—A. R. De Vains, Can., 230,818, May 8, 1923. The chlorides of ketonc or other organic products oxidized by the action of Cl on a semi-paste of cellulose are rendered sol. by treatment with alk. lye which has been used in lixiviating organic material.

Anti-Rust Paint.—Paul Peters, 230,310, Apr. 10, 1023. The compn. contains Pb_2O and a binder adapted to reduce the oxide during drying.

High Voltage Copper Oxide Depolarizers.—R. C. Benner and H. F. French, 230,246 Apr. 10, 1923. An oxidized Cu, prepared by heating an easily decomposable Cu salt, is used to form a depolarizing electrode which will give at least .05 volts higher potential than is given by roasted Cu scale under the samc conditions.

Dry Cells.—C. Hambuechen, 230,245, Apr. 10, 1923. A layer of paste is applied to the lower third of the inner surface of hollow electrodes for dry cells. The paste may be gelatinized around the inner surface of the container by immersing the latter in hot water, before inserting the mix bobbin.

Protectively Treating Materials.—A. Arent, 230,237, Apr. 10, 1923. A mixt. of a drying oil, Amyl acctate and a fire-retardant Sb compd. is applied to fibrous material to waterproof it and decrease its combustibility.

Storage Battery Containers.—A. Bugbee, 230,129, Apr. 10, 1923. A container for storage batteries is formed of an integral piece of hard porcelain and is divided by partitions formed integral with the container into several cell chambers.

Storage Battery Grid.—A. O. Garrett, C. E. Funnell and W. L. Hoffman, 230,109, Apr. 10, 1923.

Refrigerating Gas.—F. W. Andrews, 230,306, Apr. 10, 1923. A refrigerant contains SO_2 mixed with about 0.5% CO_2 to increase the latent heat of evapn. without material increase of pressure and 2.5% of CCl_4 to keep the SO_2 and CO_2 in combination and afford lubrication.

Coloring Iron and Steel.—Wm. Utendorfer, 230,528, Apr. 24, 1923. Fe and steel articles are colored black by treating them with a moderately-heated soln. composed of gallic acid, an excess of free alkali and sodium pierote.

Chlorization of Montan Wax.—A. Deschauer, 230,817, May 8, 1923. The montan wax is treated in an aq. alkali soln. with Cl gas.

Process of Plumping Leather.—J. L. Robinson, 230,859, May 8, 1923. After a chrome tanning leather is treated at 60° F. with a soln. of 15 parts HCOH in 100 parts water.

Electrolyte for Storage Batteries.—L. E. Brownell, 230,751, May 1, 1923. A battery filling compd. consists of H_2SO_4 water 0.8 gals., $MgSO_4$ 0.5, Alum 0.25 and glycerine 0.33 lbs.

INTERESTING EXHIBIT OF RUBBER CHEMICALS

Among the exhibitors at the British Industries Fair at the White City, London, was that old-established chemical firm, Messrs. Typke and King, Ltd., of Crown Chemical Works, Mitcham Common, Surrey, who gave a display at their stand of chemicals for the rubber industry. This firm has been known throughout the world for the past forty years. The main articles produced are antimony sulphides, golden and crimson, used in making red rubber goods, and especially the inner tubes of motor tires. During the past few years this company has extended their plant, and despite the general depression in trade, have been kept busy with orders both for the home and foreign markets. The samples of red rubber, which included their antimony sulphides, attracted much attention from the various callers who visited their stand. The samples of India-rubber substitutes, white and dark, used mostly for proofing, also created much interest, and the other exhibits included green oxide of chromium, yellow arsenic sulphide and pigments of all grades for the rubber and allied industries. Typke and King chemicals are handled exclusively in Canada by E. A. Schofield & Co., Montreal and Toronto.

Wm. R. Warner & Company, Limited, of New York, now operating a Canadian branch at 11 Morrison St., Toronto, have purchased the six-storey building formerly owned by R. G. Long & Company, King St. W., and will remodel and install equipment to manufacture their complete pharmaceutical line.

COMPANY NEWS

Consolidated Mining and Smelting Company of Canada, Limited.—Sales are shown at their highest level since 1918 in the annual report of this company for the twelve months ending December 31, 1922. The surplus for the year amounts to $975,449, equivalent to $2.31 each on the 421,348 shares of $25 par value capital stock outstanding. This showing is all the more creditable when it is considered that the write-off for depreciation was nearly 400 per cent. greater than usual, and that the reserve for depletion of minerals was set as an initial charge against profit and loss of over $300,000, and an appropriation of over a quarter of a million dollars for taxes. A market improvement is shown in the company's balance sheet, although only $1,000,000 of the bond issue authorized last year has been sold. As security for the special loan of $2,000,000 a like amount of the new bonds have been hypothecated. Other bank loans, overdraft, and accounts payable have been reduced by nearly two and a quarter million dollars. Sales for the year amounted to $9,576,201, as compared with $7,516,865 in 1921.

Reduction of $2,779,434 representing ores. metals and smelter product on hand and in transit as of December 31, 1921. leaves a balance of $8,975,253 as compared with $7,225,371. Customs orc, lead and bullion purchased amounting to $1,194,389 leaves a balance of $7,780,864, as compared with $6,839,373. Freight on ore from the company's mines amounted to $645,808. General expenses show a marked decrease, being $4,381,424, as against $5,270,327 the previous year. These deductions leave a balance of $2,752,632 as compared with $934,128. Development expenses amounted to $306,773 as compared with $232,693. There was set aside for depreciation the sum of $405,145 as compared with $105,356, while a new charge of $320,570 is made for depletion of minerals. the comptroller in his report stating that it is intended henceforth to write off yearly for mine depletion. The fregoing charges leave available for bond and other interest the sum of $1,720,964 as compared with $596,079 in 1921.

Assets in 1922 totalled $21,341,879, made up as follows:

Properties, $10,174,209; plant, $7,352,556; ores, metal, $2,023,763; stores, etc., $1,510,983; accounts received, $247,689; prepaid charges, $28,542; cash, $4,134.

COLONEL GAUDET APPOINTED A DIRECTOR OF CANADIAN INDUSTRIAL ALCOHOL CO.

Colonel F. M. Gaudet, C.M.G., A.D.C., has recently been elected to the Board of Directors of the Canadian Industrial Alcohol Company, Limited

Colonel Gaudet is widely known among financial and industrial circles. From 1919 to 1921 he served as commissioner of municipal service and director of public safety for the city of Montreal, while, during 1921, he was technical executive officer for the Research Council of Canada.

He is also widely known in military circles, having recruited in 1914 the famous 22nd Battalion, whose commanding officer he was until 1916, relinquishing this command when called to England by the Minister of Munitions. He is considered one of the most distinguished technical officers and military engineers in Canada.

Chemical Oil and Metal Market

CHEMICALS.

After a rather quiet period lasting during the greater part of May, the chemical market is somewhat more active. Demand for many lines fell off considerably during May, with a resulting depression to prices. In conjunction with the falling off in demand, large stocks of imported goods are reported on the market, which further depressed prices. Indeed the market generally was more or less dull throughout the greater part of the month. A change for the better was noticeable during the first week in June and already a few lines have returned to former levels, and some are actually advanced over any previous quotation, notably acetic anhydride and Glauber's salt.

There is no great need for worry, however, on the part of dealers, for the chemical market is unquestionably sound and stable, and the May depression may be safely loked upon as only a temporary affair. Proof of this may be found when the case of the heavy acids are considered. Heavy acids, especially sulphuric, are a good barometer of business, not only of the chemical industry, but of all commerce. A noted leader in the financial world once remarked. "Show me the price of sulphuric acid and I will tell you how the nations' industry is going." A glance at the quotations on heavy chemicals reveals a strength that is most encouraging. For the past six months prices on sulphuric have been steady and firm and there is absolutely no sign of any weakening. Regular buyers are taking their sulphuric regularly, while in addition the steel industry has been buying increasingly large quantities.

The following have declined the amounts noted: Ammonium chloride, ¼c lb.; copper sulphate, 5c per cwt.; caustic potash, ¼c lb.; potassium carbonate, ¼c lb.

In contrast with these declines a decided firm tendency is noted in several items. Supplies of Glauber's salt are somewhat scarce and the technical grade has advanced 5c per cwt. Lithopone is also rather scarce and nearly all producers are contracted well in advance. A good volume of business is reported in all grades of acetic acid, with prices holding firm. Demand for acetone is good. Oxalic and tartaric acids are both active with steady prices. That liquid chlorine is proving quite satisfactory to recent new users is shown by the increased demand and the fact that the liquid chlorine plant at Windsor has been doubled in capacity. Quotations are 8 to 9 cents per lb., spot, in cylinders of 100 lbs.

The coal-tar products have not been selling just as freely as in the early spring, with the exception of solvent naphtha, which is quite firm. Phenol has become irregular with the New York market, as low as 45c per lb. With gasoline selling below 30c in Toronto, the benzine market has been dull. The 90% grade was offered by producers at 25c per gal. in tank cars f.o.b. works.

CURRENT CANADIAN MARKET QUOTATIONS ON CHEMICALS, GUMS, OILS AND METALS.

GENERAL CHEMICALS

Acetone, pure, drums or over	lb.	—	.27
Lesser amounts	lb.	—	.34
ACID—			
Acetic, 28%, car. lots	100 lbs.	—	4.80
28%, 25 bbl. lots	100 lbs.	—	5.05
28%, 10 bbl. lots	100 lbs.	—	5.30
28%, 5 bbl. lots	100 lbs.	—	5.55
28%, 1 or 2 bbl. lots	100 lbs.	—	5.80
80%, carload lots	100 lbs.	—	13.20
80%, 25 bbl. lots	100 lbs.	—	15.20
80%, 15 bbl. lots	100 lbs.	—	16.20
80%, 10 bbl. lots	100 lbs.	—	16.75
80%, 5 bbl. lots	100 lbs.	—	17.20
80%, 3 or 4 bbl. lots	100 lbs.	—	18.20
80%, 1 or 2 bbl. lots	100 lbs.	—	18.50
Glacial, bbls		—	.12
Carboys	lb.	—	.12½
Boric, crystals, bbls	lb.	—	.13
Boric, powder, bbls	lb.	—	.12½
Benzoic	lb.	.85 —	.90
Citric, kegs	lb.	.45 —	.55
Formic, 75%, carboys, 100 lbs	lb.	.20 —	.22
Gallic, tech	lb.	.50 —	.55
Gallic, B. P	lb.	1.25 —	1.50
Hydrochloric, 18°, carboys, 100 lbs	lb.	2.25 —	2.75
Hydrochloric, 60%	lb.	.22 —	.25
Hydrochloric, 30%	lb.	.11 —	.13
Lactic, 44%, tech., light, bbl.	lb.	—	—
Lactic, 22%, tech., light, bbl.	lb.	—	—
Muriatic, see acid hydrochloric.			
Nitric, 36°, carboys	100 lbs.	8.25 —	8.50
Oleic	lb.	—	.26
Oxalic	lb.	.15 —	.18
Phosphoric, 85%	lb.	—	.28
Phosphoric, 50%	lb.	—	.22
Pyrogallic, resublimed	lb.	2.00 —	2.10
Salicylic, tech., bbl	lb.	.47 —	.48
Salicylic, B.P. bbl	lb.	.50 —	.52
Sulphuric, 66°, carboys	100 lbs.	2.25 —	2.75
Sulphuric, 66°, tank cars, f.o.b. works	ton	23.75 —	24.00
Stearic, double pressed	lb.	.22 —	.24
Stearic, triple pressed	lb.	.25 —	.27
Tannic, B.P	lb.	.70 —	.80
Tannic, tech	lb.	.45 —	.55
Tartaric, crystals, bbls	lb.	—	—
Tartaric, powder, bbls	lb.	—	—
ALCOHOL, absolute Ethyl, case of 1 doz. 1 lb. bottle		—	3.15
In steel drums of 10 gals. capacity	Imp. gal.	—	23.00
Acetone, bbls. or over	gal.	—	1.15
Lesser amounts	gal.	—	1.45
Aldehyde Ammonia	lb.	—	.75
Alum, Ammonia, lump or ground	100 lbs.	4.50 —	5.00
Aluminium Sulphate, lump			
bags	100 lbs.	2.25 —	2.50
Ground, bags	100 lbs.	2.50 —	2.75
Iron, free	100 lbs.	—	4.00
Ammonia, aqua, 26°, carboys	lb.	.13 —	.14
Drums	lb.	—	.09½
AMMONIUM, Carbonate	lb.	.12 —	.15
Chloride	lb.	.10 —	.13
Amyl Acetate, tech	gal.	—	4.00
Pure	lb.	—	.80
Arsenic, white	lb.	.15 —	.17
BARIUM, Sulphate, B.P	ton	—	60.00
Chloride	lb.	.06 —	.08
Nitrate	lb.	—	.16
Peroxide	lb.	—	.26
Blanc fixe, dry, bbl	lb.	—	—
Pulp, bbl	ton	—	—
Bleaching Powd., 35%, drums	lb.	2.50 —	3.00
Borax, crystals	lb.	.06½ —	.06¾
Bromine, tech	lb.	—	.38
Benzaldehyde	lb.	1.35 —	1.60
CALCIUM ACID, Phosphate	lb.	—	.07½
Carbide, ton lots, f.o.b. wks	ton	—	95.00
Carbide, less than ton lots	ton	—	100.00
Chloride, fused	ton	—	31.00
Chloride, flake	ton	44.00 —	48.00
CAUSTIC SODA, flake, drms.	100 lbs.	5.00 —	5.50
Ground, drums	100 lbs.	5.00 —	5.50
Solid, drums	100 lbs.	4.25 —	4.75
CARBON BISULPHIDE, drums	lb.	.12 —	.13
Tetrachloride, drums	lb.	—	.15
Cobalt Oxide, black	lb.	—	2.00
Grey	lb.	—	2.25
Copperas, crystals	lb.	.02 —	.02½
Sugar	lb.	.02 —	.02½
Copper Sulphate (blue vitriol)	lb.	.08 —	.08¼
Corrosive Sublimate (mercuric chloride)	lb.	1.15 —	1.20
Dextrine, potato	lb.	—	.06
Corn	lb.	—	.08½
ETHER, B.P. (conc.)	lb.	—	.55
Sulphuric	lb.	.30 —	.35
Ferric Chloride, crystals	lb.	.13 —	.14
Solution	lb.	—	.10
Formaldehyde, bbls. or over	lb.	—	.19½
200-lb. kegs	lb.	—	.24½
100-lb. kegs	lb.	—	.25½
50-lb. kegs	lb.	—	.26½
Fullers' Earth, powder	100 lbs.	2.00 —	2.50
Car lots, f.o.b. Toronto	ton	—	30.00
Fusel Oil, special, refined	gal.	4.00 —	4.50
Glycerine, crude, drums	lb.	—	.15
Crude, single tin of 56 lb.	lb.	—	.17
C.P., single tin of 56 lbs.	lb.	—	.29
C.P., two or more tins	lb.	—	.27
C.P. drums, 500-1,000 lbs.	lb.	—	.21
Pale straw, drums, 500-1,000 lbs	lb.	—	.20
Pale straw, single tin 56 lb.	lb.	—	.28
Pale Straw, 2 or more tins	lb.	—	.26
Hexamethylene Tetramine	lb.	—	.85
Hydrogen Peroxide	gal.	.70 —	.75
Iron Oxide, red, casks	lb.	.13 —	.20
LEAD, Acetate	lb.	.14 —	.16
Nitrate	lb.	.14 —	.15
Lime, grey	ton	—	14.30
Grey, in car lots	ton	—	11.70
Hydrated, in ton lots	ton	—	20.00
Litharge	lb.	.09 —	.10
Lithopone	lb.	—	.07½
Magnesite, Calcined	ton	—	30.00
Clinkered	ton	—	35.00
Raw	ton	—	10.00
MAGNESIUM, Carbonate, bbls.	lb.	.14 —	.16
Sulphate, B.P	ton	60.00 —	70.00
Technical, car lots	ton	45.00 —	50.00
Methyl Hydrate (wood Alcohol), 95%, bbls. or over	gal.	—	1.15
95%, half-bbl. lots	gal.	—	1.25
95%, lesser amounts	gal.	—	1.30
97%, bbls	gal.	—	1.20
97%, half-bbl. lots	gal.	—	1.35
97%, lesser amounts	gal.	—	1.50
Nickel Salt, single, in bbl. lots	lb.	—	.13½
Single, per cwt	lb.	—	.15
Double, barrel lots	lb.	—	.14
Double, per cwt	lb.	—	.15½
Phosphorus, yellow	lb.	—	.34
Potash Prussiate, yellow	lb.	.32 —	.34
POTASSIUM, Bicarbonate	lb.	—	.20
Bichromate	lb.	.17 —	.18
Carbonate, calc. 80-85%	lb.	—	.11
Chlorate	lb.	—	.10
Citrate	lb.	.90 —	1.00
Hydroxide (caust. potash)	sticks	—	.45
Hydroxide (caustic potash), small drums	lb.	.10 —	.15
Hydroxide (caustic potash) large drums	lb.	.09 —	.10
Nitrate, casks	lb.	.10 —	.12
Permanganate, bulk	lb.	.19 —	.20
Red Precipitate (mercuric ox.)	lb.	—	1.75
Silver Nitrate	lb.	—	9.00
Soda Ash, bags	cwt.	2.25 —	2.40
SODIUM, Acetate, ton lots or ov.	lb.	—	.08
Lesser amounts	lb.	—	.08½
Aluminium Phosphate	lb.	—	.03½
Benzoate	lb.	.60 —	.85
Bicarbonate, 100% pure	lb.	2.50 —	3.00
Bichromate, bbls	lb.	.10 —	.13
Bisulphite, powder	lb.	.05½ —	.06
Bisulphite, 35 Be	lb.	.03 —	.03¼
Bromide (foreign)	lb.	—	.28
Cyanide, bulk, 98-99%, in cases	lb.	—	.34
Fluoride, 95-98%	lb.	.15 —	.16
Hyposulphite, kegs	100 lbs.	4.75 —	5.00
Barrels	cwt.	4.00 —	4.50
Iodide	lb.	—	4.90
Nitrate, refined	cwt.	6.75 —	7.00
Crude, 95%	cwt.	5.25 —	5.75
Nitrite	lb.	.12 —	.15
Perborate, U.S.P	lb.	.35 —	.40
Peroxide, f.o.b. New York	lb.	.30 —	.35
Silicate, 42°, car lots	cwt.	—	1.35
Smaller lots	cwt.	—	1.55
Silicate, 40°, car lots	cwt.	—	1.25
smaller lots	cwt.	—	1.45
Sulphide, 60-62% fused	lb.	.08 —	.09
Sulphate (Glauber's Salts), crystals, in bags	cwt.	1.80 —	2.00
Car lots	cwt.	1.65 —	1.70
Sulphite	lb.	—	.05
Prussiate, yellow	lb.	.24 —	.25
Sulphur, ground	100 lbs.	2.50 —	2.75
Roll	100 lbs.	4.25 —	4.75
Talc, No. 1 grade	ton	—	30.00
No. 2 grade	ton	—	25.00
No. 3 grade	ton	—	23.00
Tin Chloride, crystals	lb.	.30 —	.35
Tri-Sodium Phosphate	lb.	.07 —	.07½
Ultramarine, blue	lb.	.10 —	.29
White Precipitate (mercuric-Ammonium chloride)	lb.	—	1.85
Whiting (English)	ton	—	30.00
(American)	ton	—	28.00
ZINC, Sulphate, com	lb.	.05 —	.05½
Dust	lb.	.13 —	.14½
Oxide, lead free	lb.	.11 —	.12
Stearerate	lb.	.30 —	.35

PHARMACEUTICAL CHEMICALS

AMMONIA, Aqua, C.P	lb.	—	.22
Iodide	lb.	—	6.25
Asperin, 100 lb. lots, bulk	lb.	.75 —	.95
Caffeine, English	lb.	—	3.50
Calomel (mercurous chloride	lb.	1.50 —	1.60
Camphor, Monobromate	lb.	—	3.00
Refined, slabs	lb.	—	1.28
Refined, Tab	lb.	—	1.32
Carbolic Acid, white crystals	lb.	.38 —	.40
Chloroform	lb.	.45 —	.55
Coumarin	lb.	3.00 —	3.50
Cream Tartar, 98%	lb.	.25 —	.30

Ether, B.P.	lb.	.....	— .55
Iodine, crude	lb.	4.50	— 4.75
Resublimed	lb.	5.50	— 5.60
Lithium Carbonate	lb.	1.80	— 2.10
Potassium Bromide, crystals	lb.	.28	— .34
Granular	lb.	.28	— .34
Iodide	lb.	.....	— 4.40
Phenacetin	lb.	1.75	— 2.00
Phenolphthalein	lb.	.....	— 1.50
Quinine	oz.	.70	— .75
Saccharin	lb.	1.75	— 2.25

SYNTHETICS

Benzyl, Acetate	lb.	.....	— 1.75
Benzoate	lb.	.....	— 1.75
Citral	lb.	.....	— 4.50
Coumarine	lb.	.....	— 3.50
Heliotropine	lb.	.....	— 5.00
Linalyl Acetate	lb.	.....	—13.50
Methyl Salicylate	lb.	.....	— .75
Musk, Xylol	lb.	.....	— 3.00
Teyseniol	lb.	.....	— 1.00

ESSENTIAL OILS

Anise	lb.	.....	— .80
Bay	lb.	.....	— 3.00
Bergamot	lb.	.....	— 4.50
Cajaput	lb.	.....	— 1.25
Camphor, white	lb.	.....	— .50
Brown	lb.	.....	— .25
Cassia	lb.	.....	— 2.00
Cedar Leaf	lb.	1.90	— 2.00
Cedar Wood	lb.	.....	— .50
Citronella, Ceylon	lb.	.....	— .60
Java	lb.	.....	— .85
Clove	lb.	.....	— 2.25
Eucalyptus	lb.	.....	— .65
Geranium Bourbon	lb.	.....	— 7.50
Lavender	lb.	.....	— 5.00
Spike	lb.	.....	— 1.25
Lemon	lb.	.....	— .75
Lemongrass	lb.	.....	— 1.35
Lime, distilled	lb.	.....	— 1.00
Orange Sweet, Sicilian	lb.	.....	— 3.50
West Indian	lb.	.....	— 3.00
Peppermint, American	lb.	.....	— 3.50
Japanese	lb.	1.75	— 2.00
Redistilled, B.P.	lb.	4.00	— 4.25
Pathouli	lb.	.....	—10.00
Otto of Rose	lb.	.....	— 6.50
Rosemary	lb.	.....	— .65
Sandalwood	lb.	.....	— 7.50
Sassafras	lb.	.....	— 1.75
Thyme	lb.	.....	— 1.45

VEGETABLE OILS

Castor Oil, No. 3, bbl.	lb.	.....	—.....
AA, bbl.	lb.	.....	—.....
Cocoanut, Ceylon, bbl.	lb.	.....	—.....
Cochin, bbl.	lh.	.....	—.....
Corn Oil, bbls.	lb.	.....	— .12
Tank cars	lb.	.10	— .10½
Cottonseed Oil, crude, f.o.b. U. S. mills, tanks	lb.	.10	— .10
Summer, yellow, bbl.	lb.	.12	— .12½
Winter, yellow, bbl.	lb.	.13	— .13¼
Linseed Oil, 1 to 2 bbls., Raw, per gal. of 9 lbs.		.....	— 1.50
3 to 5 bbls., Raw, per gal. of 9 lbs.		.....	— 1.49
6 to 9 bbls., Raw, per gal. of 9 lbs.		.....	— 1.47
Linseed Oil, 3c per lb. higher than raw		.....	—.....
Monopole Oil	lb.	.07	— .16
Olive Oil, foots	lb.	.12	— .14

GUMS

Arabic, clear amber sorts	lb.	.....	— .22
Regular grain No. 4 and No. 5	lb.	.....	— .30
Regular grain No. 2	lb.	.....	— .31
White sorts	lb.	.....	— .35
Powdered, No. 1	lb.	.....	— .40
Powdered, No. 2	lb.	.....	— .39
Indian, No. 1A	lb.	.....	— .28
No. 1	lb.	.....	— .25
Tragacanth, No. 1, ribbon	lb.	.....	— 3.00
No. 1, flake	lb.	.....	— 2.00
Turkey	lb.	.....	— 2.00

VARNISH RESINS

Congo, sorts	lb.	.10	— .11
Hard amber	lh.	.11½	— .18
White	lb.	.35	— .45
Damar, Batavia	lb.	.35	— .38
Singapore, No. 1	lb.	.39	— .45
Singapore, No. 2	lb.	.20	— .24
Singapore, No. 3	lb.	.09½	— .12
East India, pale bold	lb.	.22	— .25
Pale nubs	lh.	.15	— .17
Pale chips	lb.	.07	— .12
Black bold	lh.	.09	— .12
Black nubs and chips	lh.	.05	— .08
Kauri, XXXXX	lh.	1.60	—.....
XXXX	lb.	1.25	—.....
XXX	lb.	1.10	—.....
XX	lb.	.90	—.....
X	lb.	.80	—.....
No. 1	lb.	.67	— .70
No. 2	lb.	.45	— .50
No. 3	lb.	.25	— .30
B. X.	lb.	.55	— .65
B. 2	lb.	.30	— .35
No. 1 chips	lb.	.22	— .27
Brown chips	lb.	.15	— .20
Dust	lb.	.10	— .15
Manila, Bold XXXXX	lb.	.21	— .23
Nubs, pale	lb.	.18	— .22
Nubs, amber	lb.	.10	— .18
Soluble A	lb.	.16	— .18
Soluble chips	lb.	.10	— .12
Pontianac Bold	lb.	.20	— .30
Genuine nubs	lb.	.14	— .17
Genuine chips	lb.	.10	— .12

WAXES

Bayberry	lb.	.35	— .38
Beeswax, white, pure	lb.	.....	— .38
African	lb.	.....	— .30
Brazilian	lb.	.....	— .34
Chilean	lb.	.....	— .35
Refined	lb.	.....	— .31
Candelilla	lb.	.40	— .42
Carnauba, No. 1, bags	lb.	.....	— .50
No. 2, North Country	lb.	.....	— .32
No. 3, North Country	lb.	.....	— .22
No. 3, chalky	lb.	.....	— .21
Ceresin, white	lb.	.....	— .12¼
Yellow	lb.	.....	— .12
Japan	lb.	.19	— .20
Montan, crude	lb.	.06	— .07
Ozokerite, crude, brown	lb.	.16	— .17
Black, 158°—160°, M.P.	lb.	.18	— .19
Paraffin, 128°—130°, M.P., 250 lb. lots	lb.	.....	— .06
118°—120°, M.P., 250 lb. lots	lb.	.....	— .05
Parowax, blocks, 100 lb. lots	lb.	.....	— .08¾

SHELLAC

T.N.	lh.	.....	— .85
Superfine Orange	lb.	.....	— .90
A. C. Garnet	lb.	.....	— .82
Bone Dry	lb.	.....	— .99

NAVAL STORES, FLOTATION OILS

Pine Tar Oil, crude	gal.	.....	—.....
Refined	gal.	.....	—.....
Double, ref.	gal.	.....	—.....
Rosin, G., 280 lb. bbl. lots	bbl.	.....	— 8.25
W.W., 280 lb. bbl. lots	bbl.	.....	—10.50
Turpentine, 1 bbl. lots	Imp. gal.	.....	— 2.30
2 to 4 bbl. lots	Imp. gal.	.....	— 2.29
5 gallon lots	Imp. gal.	.....	— 2.45

PETROLEUM OILS AND DISTILLATES

Mid-Continent Crude, 42 W. gal.	bbl.	.....	— 1.45
Pennsylvania Crude, 42 W. gal.	bbl.	.....	— 3.25
Coal Oil	gal.	.....	— .18
Fuel Oil, bbls.	gal.	.....	— .11
Tank cars	gal.	.....	— .09
Gasoline, motor	gal.	.....	— .25
Service stations	gal.	.....	— .29
Gasoline, lighting	gal.	.....	— .30
Naphtha	gal.	.....	— .24

COAL TAR PRODUCTS

Alpha—Naphthylamin	lb.	.....	— .52
Benzol, 100%	Imp. gal.	.....	— .65
90%	Imp. gal.	.....	— .60
Carbolic Acid, crude, 30%	gal.	.....	— .40
Creosote Oil, crude	gal.	.....	— .40
Refined	gal.	.....	— .60
Coal Tar, crude	bbl.	.....	—10.25
Refined	bbl.	.....	—11.50
Coal Tar Pitch, bbls	cwt.	.....	— 2.00
Cresol, U.S.P., f.o.b. N.Y.	lb.	.25	— .27
Dep Oil, 25%, f.o.b. N.Y.	gal.	.25	— .28
H. Acid, f.o.b N.Y.	lb.	.....	— .85
Phenol, drums	lb.	.60	— .65
Pyridine, f.o.b. N.Y.	gal.	2.75	— 3.00
Resorcinol, tech, f.o.b. N.Y.	lh.	1.40	— 1.50
Pure, f.o.b. N.Y.	lb.	2.00	— 2.10
Naphthalin, flake	lb.	.....	— .09
Balls	lb.	.....	— .10
Solvent Naphtha, refined	gal.	.....	— .48
Toluol, pure	gal.	.....	— .54
Xylene, pure, f.o.b. N.Y.	gal.	.75	— .85
Comm., drums, f.o.b. New York	gal.	.....	— .37

FERTILIZER MATERIALS

Acid Phosphate	ton	$28.00	—30.00
Animal Tankage, per unit of ammonia		.....	— 3.50
Per unit of bone phosphate of lime		.....	— .10
Nitrate of Sode		65.00	—70.00
Muriate of Potash	ton	.....	—40.00
Pure Ground Blood, per unit of ammonia		.....	— 4.00
Steamed Bone Meal	ton	.....	—30.00
Sulphate of Ammonia	ton	68.00	—70.00

TANNING AND DYEING MATERIAL

Chestnut Liquid Extract	lh.	.02½	— .03½
Fustic Crystals	lb.	.26	— .30
Ground Sumac	ton	65.00	—70.00
Hematine Crystals	lb.	.18	— .22
Hemlock Liquid Extract	lb.	.03½	— .04
Liquid Sumac Extract	lh.	.08	— .09
Logwood, Solid	lh.	.18	— .22
Quebracho Liquid Extract	lb.	.03	— .03½
Quercitron Liquid Extract	lb.	.07	— .08

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Para, upriver fine	lb.	$	— .28
Upriver, coarse	lh.	.....	— .23
Caucho hall	lb.	.....	— .25
Plantation, 1st latex crepe	lb.	.....	— .31
Ribbed smoked sheets	lb.	.35½	— .35¾
Brown crepe, thin, clean	lb.	.....	— .29
Amber crepe, No. 1	lb.	.....	— .29½

MISCELLANEOUS MATERIAL

Asbestos, crude, No. 1, f.o.b. Quebec	ton	.....	—500.00
Shingle, f.o.b. Quebec	ton	70.00	—80.00
Cement, f.o.b. Quebec	ton	21.00	—25.00
Barytes, floated	ton	30.00	—35.00
Crude, f.o.b. mines	ton	10.00	—11.00
Casein, tech., bbls.	lb.	.28	— .30
China Clay, f.o.b. Huberdean, Que., car lots	ton	17.00	—18.00
Imported	ton	20.00	—23.00
Feldspar, No. 1, f.o.b. mill	ton	25.00	—27.00
Fluorspar, ground	ton	25.00	—28.00
Graphite, crude high grade	ton	35.00	—45.00
Ceylon, lump	lb.	.06	— .06½

INDUSTRIAL GASES

Acetylene, cylinders	100 cu. ft.	$2.55	— 3.00
Coal Gas, cylinders	100 cu. ft.	3.00	— 4.00
Hydrogen, cylinders	100 cu. ft.	1.50	— 2.00
Nitrogen, cylinders	100 cu. ft.	2.00	— 3.00
Oxygen, cylinders	100 cu. ft.	1.50	— 2.00

METALS

Aluminium, 98-99%, 15 ton lots	lb.	.....	— .24
Antimony	lb.	.....	— .08¾
Brass, yellow ingots	lb.	.....	— .12
Red	lb.	.....	— .16½
Rods	lb.	.....	— .19
Cobalt	lb.	3.00	— 3.25
Copper electrolytic, small lots	cwt.	.....	—17.65
Car lots	cwt.	.....	—17.15
Casting, small lots	cwt.	.....	—16.65
Casting, car lots	cwt.	.....	—16.15
Gold, pure	oz.	23.00	—25.00
Iron, pig	ton	.....	—34.00
Bar iron, base	cwt.	.....	— 3.75
Lead, pig, small lots	cwt.	.....	— 7.50
Car lots	cwt.	.....	— 7.00
Magnesium, ribbon	oz.	.....	— 1.50
Ribbon	lb.	.....	—18.00
Powder	oz.	.60	— .65
Monel Metal, machined rods	lb.	.....	— .50
Blocks	lb.	.....	— .34
Shot	lb.	.....	— .34
Sheet, hot rolled, on orders of over 500 pounds, of one gauge	lb.	.....	— .48
rods, hot rolled	lb.	.....	— .42
Rods, cold rolled	lb.	.....	— .53
Nickel, shot or ingot	lb.	.....	— .35
Platinum, pure	oz.	.....	—124.00
5% iridium	oz.	.....	—128.00
10% iridium	oz.	.....	—138.00
Silver, bar, American silver	oz.	.....	— .99¼
Bar, Canadian produced, U.S. funds	oz.	.....	— .67¼
Steel, mild, ¼-inch, base price	cwt.	.....	— 3.75
3/16-inch, base price	cwt.	.....	— 4.25
Black sheet, 28 gauge, size 30"	cwt.	.....	— 5.65
Black sheet, 28 gauge, size 36"	cwt.	.....	— 5.75
Sheets, galvanized, 28 gauge, 30"	cwt.	.....	— 6.75
Blue sheets, base	cwt.	4.50	— 4.60
Sheets, galvanized, 28 gauge, 36"	cwt.	.....	— 7.00
Tin	lb.	.....	— .51
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Zinc, (spelter), small lots	cwt.	.....	— 8.10
Car lots	cwt.	.....	— 7.60

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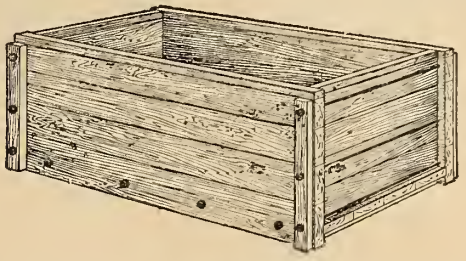

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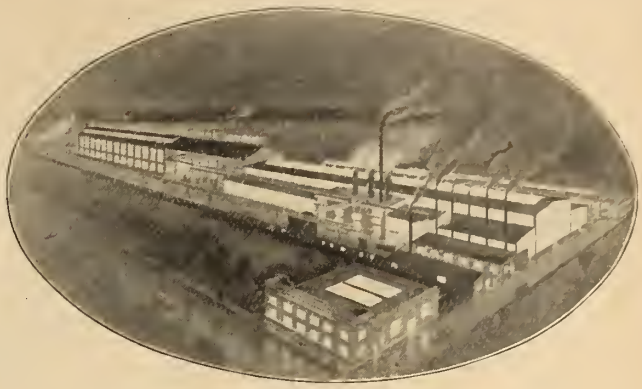

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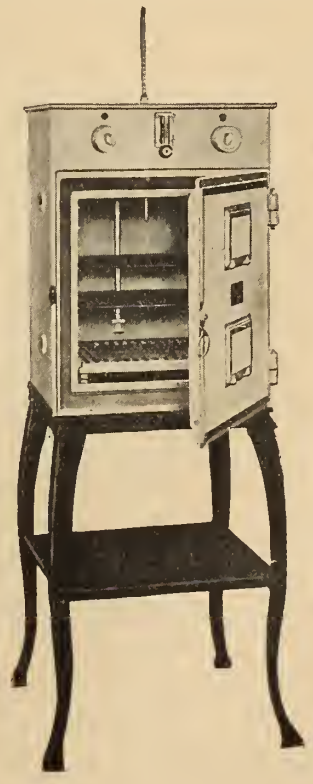

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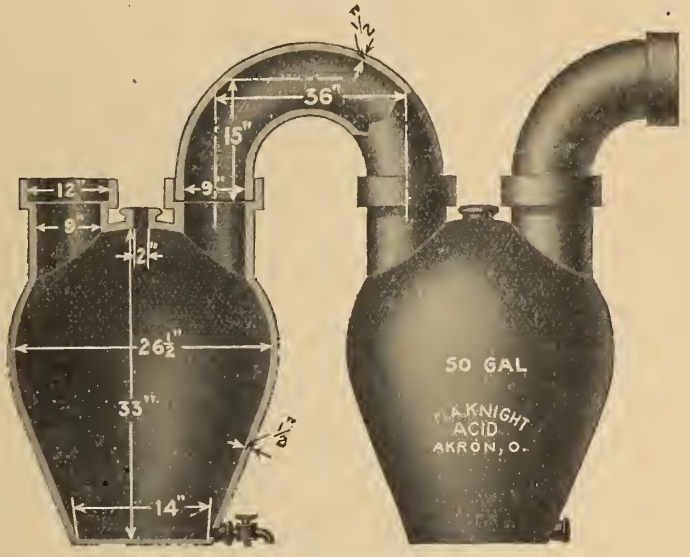

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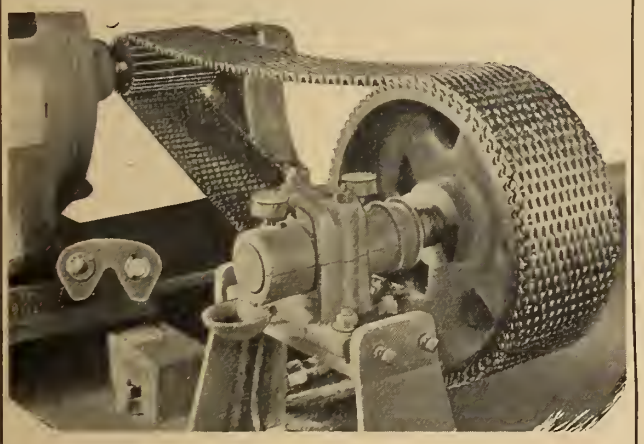

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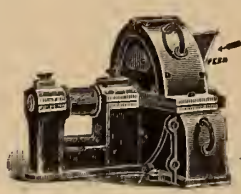

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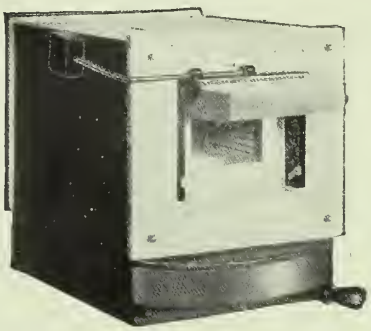

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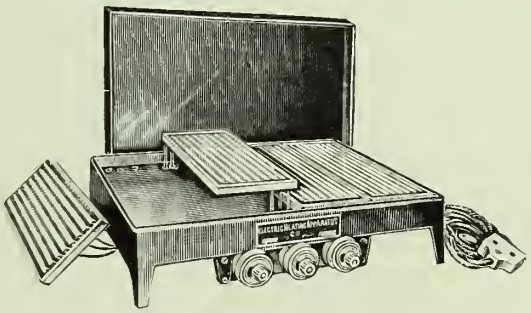

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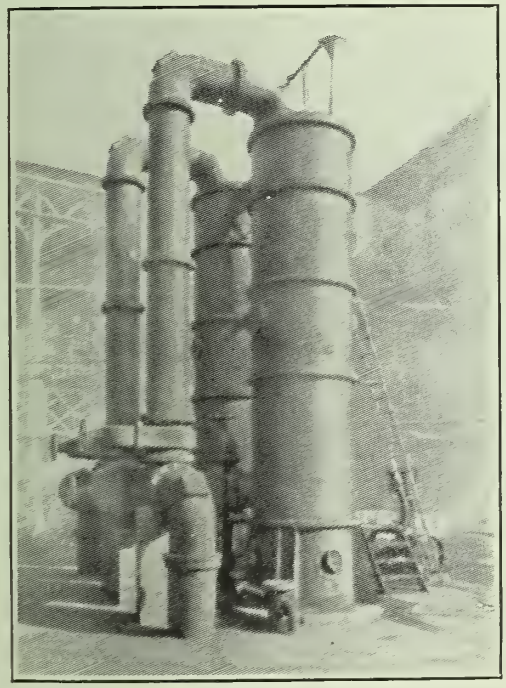

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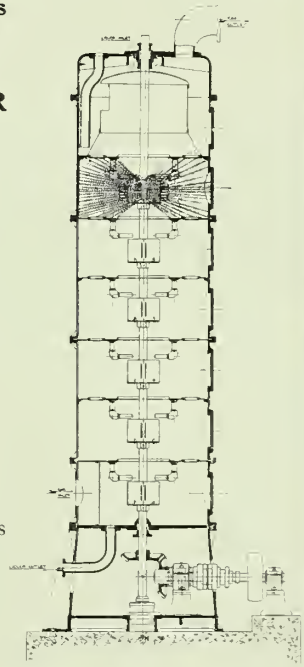

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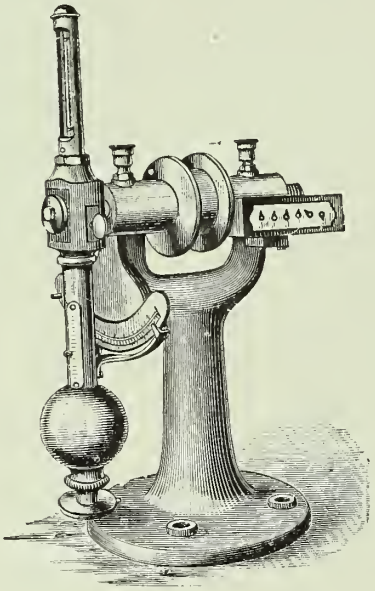

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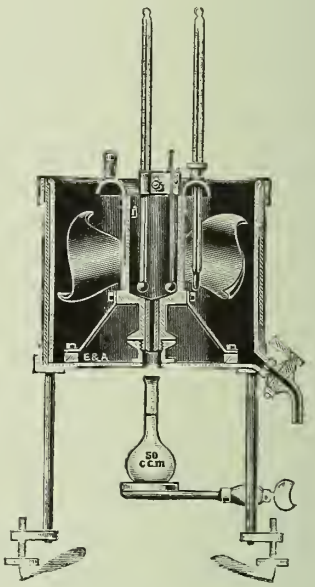
We have no Canadian branch. However, the concentration of materials in New York enables us to make prompt shipments to Canada.



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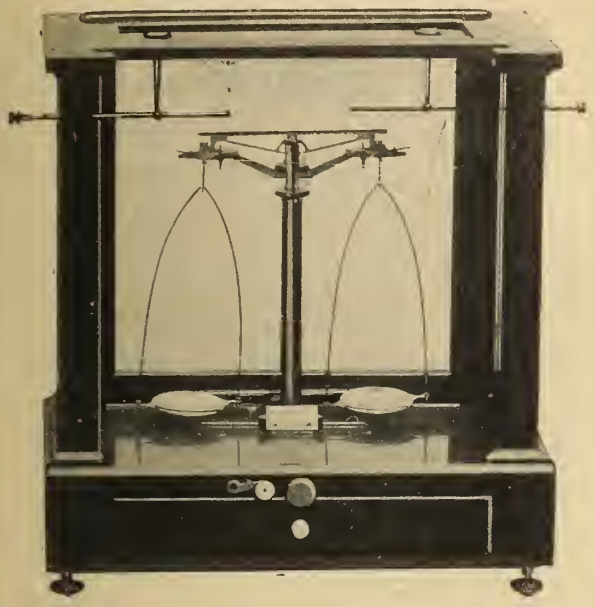

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Two Leaders in Stock for Immediate Delivery

BALANCE—Becker's Sons (Rotterdam), capacity 200 grams in each pan, sensitive to 1/20 milligram, beam of aluminum, 6" long, divided on both sides into 1/10 milligram. The rider may be used on either side of beam. The bearings and knives are agate. Mounted on heavy glass plate in glass and mahogany case with glass top and counterpoised door. With riders, specific gravity support, weighing tube support with counterpoise, and key with which the drawer and door may be locked. This is Becker's Standard Analytical Balance **$135.00**

BALANCE—Becker's Sons (Rotterdam). Short aluminum beam, 6" long, graduated to 1/10 milligram, capacity 100 grams, sensitive to 1/20 milligram. Bearings and knives of agate, mounted on heavy glass plate in glass and mahogany case with glass top. Beam with rider arrangement. With arrangement for arrest of beam and pans. When the balance is at rest the bearings and knives are not in contact **$100.00**

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PROVINCE OF ONTARIO

Hon. H. Mills, Minister. DEPARTMENT OF MINES *Thos. W. Gibson, Deputy Minister.*

Preliminary Summary of Mineral Statistics

(Quantities represent shipments. Tons throughout are short tons of 2,000 pounds)

Product		1921 Quantity	1921 Value	1922 Quantity	1922 Value
METALLIC					
Gold	ounces	709,509	$14,624,085	$1,000,199	$20,674,109
Silver	"	8,412,059	5,497,160	9,167,846	6,491,271
Platinum metals (a)	"	915	51,060	642	38,884
Copper	lbs.	3,070,719	356,708	4,503,358	515,093
Nickel, metallic	"	5,430,147	1,825,359	11,175,326	3,171,434
Nickel, oxide	"	1,402,019	285,391	2,399,887	391,119
Cobalt, metallic	"	32,718	98,228	109,067	282,602
Cobalt, oxide	"	155,554	354,418	398,697	798,271
Other nickel and cobalt compounds and residues	"	108,814	114,069	1,070,935	255,034
Copper in matte exported (b)	tons	3,686	737,142	7,774	1,554,731
Nickel in matte exported (b)	"	4,850	1,939,851	8,689	3,475,649
Iron and briquettes (c)	"	100	459	4,304	25,261
Iron, pig (d)	"	82,838	2,079,729	14,052	340,730
Lead, pig	lbs.	3,570,222	190,843	2,895,695	173,742
Zinc (e)	"	.....	.....	100,283	2,181
Total metallic		.....	$27,574,202	.....	38,190,711
NON-METALLIC					
Actinolite	tons	78	$ 975	$ 50	$ 345
Apatite (Phosphate of Lime)	lbs.	.....	.....	31	248
Arsenic, white	"	2,982,525	233,763	4,118,695	299,940
Arsenate of Iron	"	.....	.....	75,000	938
Corundum	tons	402	50,250	.....	.....
Feldspar, crude and ground	"	15,506	114,059	15,515	94,985
Fluorspar	"	115	1,744	284	3,905
Graphite, crude and refined	"	363	23,273	626	34,124
Gypsum, crushed, ground and calcined	"	84,765	433,053	110,227	621,668
Iron Pyrites	"	19,375	91,604	11,235	39,763
Mica	"	222	29,630	2,229	56,480
Mineral water	Imp. gals.	.....	9,000	31,970	6,118
Natural gas	M. cu. ft.	8,590,000	2,953,000	7,919,390	3,902,800
Peat	tons	500	2,000	3,000	14,500
Petroleum	bbls.	172,859	466,716	164,732	439,286
Quartz and silica brick	tons	12,957	74,635	82,882	149,302
Salt	"	149,599	1,509,287	161,551	1,537,512
Talc., crude and ground	"	9,967	140,390	12,874	178,397
Construction Materials—($11,527,529)—					
Cement, Portland	bbls.	2,723,072	6,425,266	3,104,386	6,235,370
Lime	tons	91,355	1,172,680	116,769	1,315,479
Sand and gravel	cu. yds.	1,412,956	668,098	2,132,875	1,001,088
Sand-Lime brick	M.	.....	456,700	48,924	770,597
Stone, building, trap, granite		.....	1,812,863	.....	2,205,025
Clay Products—($5,103,618)					
Brick, common	M.	99,463	1,743,094	105,536	1,803,349
Brick, pressed	"	31,481	673,087	44,892	900,111
Brick, tapestry or rug	"			22,453	514,666
Tile, drain	"	9,910	250,040	10,110	260,312
Tile, building and floor		.....	211,529	.....	562,566
Pottery		.....	67,985	.....	88,889
Sewer pipe		.....	939,464	.....	973,824
Total non-metallic		.....	20,554,185	.....	24,011,458
Add metallic		.....	27,574,202	.....	38,190,711
Grand Total		.....	$48,128,387	.....	$62,202,169

(a) Recoveries from Canadian and United States refineries. (b) Copper and nickel exports in the form of matte were valued, respectively, at 10 and 20 cents per pound. (c) Exports and shipments to points other than Ontario blast furnaces. (d) Proportional product from Ontario ore smelted. (e) Recovery from concentrates shipped in 1919 and not previously reported.

Dividends and Bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies, or a total of $114,334,884.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

For illustrated reports, geological maps, mining laws, and list of publications, apply to Thomas W. Gibson, Deputy Minister of Mines, Parliament Buildings, Toronto, Ont.

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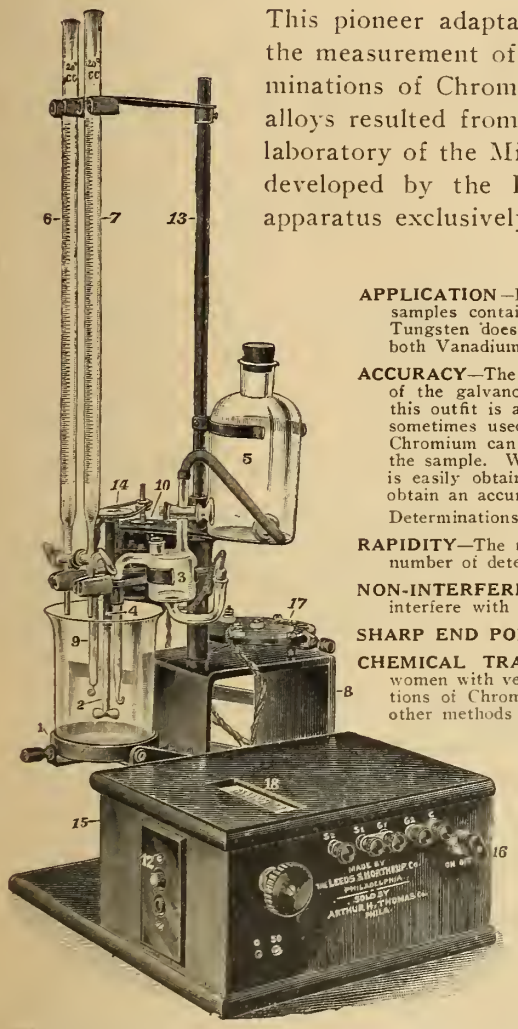
THE TEST

IN OUR STOCK FOR IMMEDIATE SHIPMENT

OF SERVICE



This pioneer adaptation of the principles of electrometric titration—by the measurement of the change of oxidation potential—to routine determinations of Chromium, Vanadium and Manganese in steel and various alloys resulted from work by Dr. G. L. Kelley and his associates in the laboratory of the Midvale Steel and Ordnance Company, and was further developed by the Leeds & Northrup Company, who now make the apparatus exclusively for us.

ADVANTAGES :

APPLICATION—Determinations of Chromium and Vanadium in steel can be made on samples containing one or both of these elements. The presence of Molybdenum and Tungsten does not interfere. Manganese can be determined readily in the presence of both Vanadium and Chromium.

ACCURACY—The accuracy of an electrometric titration depends primarily on the sensitivity of the galvanometer. The Leeds & Northrup Lamp and Scale Galvanometer built into this outfit is approximately **forty times as sensitive** as the pointer type of galvanometer sometimes used as an indicating instrument in electrometric titrations. For example: Chromium can be determined to .1% where the Chromium content is as high as 20% of the sample. When the Cr content is from .2% to 3% of the sample, an accuracy of .01% is easily obtainable; and for small amounts of Cr, i.e., less than .2%, it is possible to obtain an accuracy of .002% to .003%.

Determinations of above accuracy cannot be equalled by other than electrometric methods.

RAPIDITY—The method is rapid, the saving in time being especially notable when a large number of determinations are made.

NON-INTERFERENCE OF COLOR OR TURBIDITY—Strong color or turbidity does not interfere with the determination since no chemical indicators are necessary.

SHARP END POINTS—The end points are sharp and easily determined.

CHEMICAL TRAINING NOT REQUIRED FOR DETERMINATIONS—Young men or women with very little experience in laboratory work are able to make accurate determinations of Chromium, Vanadium and Manganese in steel. Such analyses can be made by other methods only by men of large experience and a high degree of skill.

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One or more Kelley Electrometric Titration Outfits are now in successful use in the laboratories of the larger steel companies throughout the world, such as Midvale Steel & Ordnance Co., Jones & Laughlin Steel Co., Carpenter Steel Co., United Alloy Steel Co., Ludlum Steel Co., Crucible Steel Co. of America, Hadfields, Ltd. (Sheffield, England), Sociedad Espanol de Construccion Naval (Madrid, Spain), K. Nishikawa & Co. (Dairen, Manchuria), Brunner Mond & Co. (Northwich, Engand), Mitsubishi Co. (Tokyo, Japan), and many others.

4920. KELLEY ELECTROMETRIC TITRATION OUTFIT, complete as shown in illustration, including galvanometer, resistance, mirror, etc., enclosed in box marked 15; paired burettes, 6 and 7; calomel electrode, 3; platinum electrode, 9; aspirator bottle, 5; glass stirrer, 2, etc. With universal motor for 110 volts, a.c., 60 cycles, or 110 volts, d.c. $250.00

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Copy of Supplement No. 67, "The Kelley Electrometric Titration Apparatus," which contains a detailed description of this apparatus, together with directions for operation and various methods of analysis, sent upon request.

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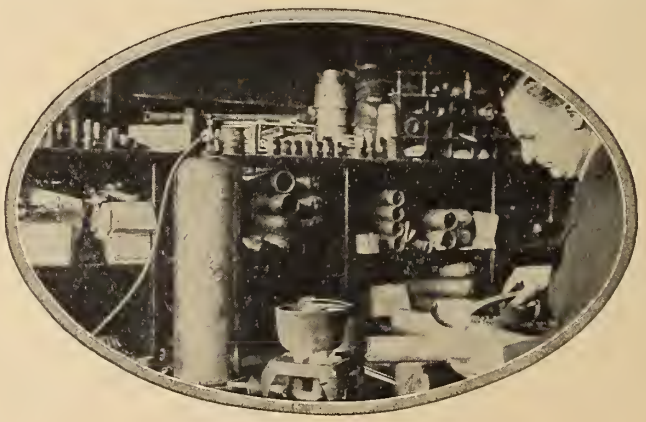

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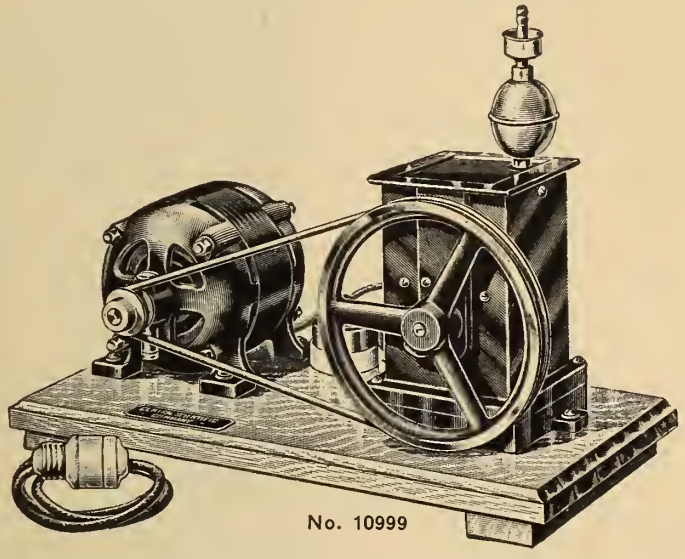

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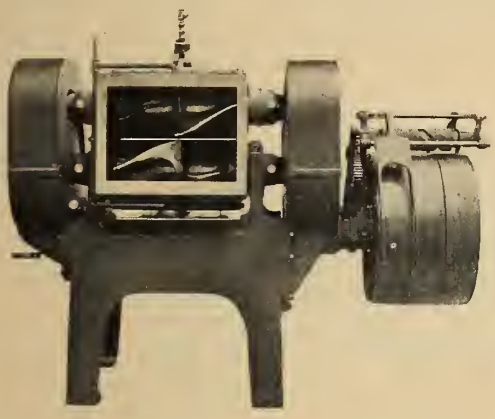

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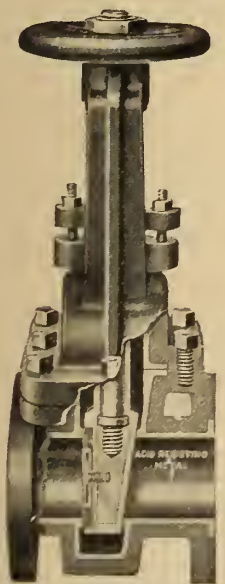

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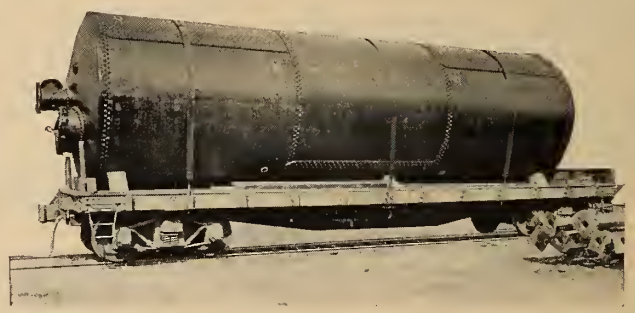

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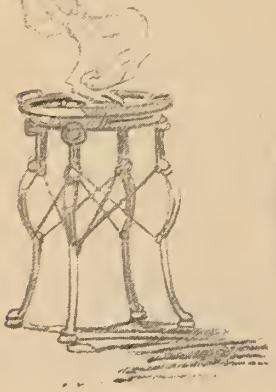

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From the Publishers—

This Journal and Your Profession

It is not necessary to argue that trade and technical papers are a great help to the business or industry they serve. This has been amply proved in the past and is being demonstrated every day in every civilized country. But there is the odd individual (we met one—a chemist—a few weeks ago) who declared he never reads any journal. Of course he pleaded the old time falsity that he hadn't the time. He had barely time, he said, to even look at the daily papers.

Now the trouble with that chap wasn't lack of time, but lack of ability to systematize anything, either himself or his work. We rather suspect that his work is in a grand rush and mess most of the time, and that he is subjected to several brain storms per day.

Over against such odd characters, we know there are hundreds of men in the profession who are enjoying the reading of their journal, for, as we have said before, this is really "their" paper. We are a young country and a fairly "young" publication, but we believe this paper is progressing—at least not a few men in the industry and profession tell us so. And we want to keep on improving and with your good wishes and co-operation we know we can, and thus play a real part in building up the chemical industry in this country.

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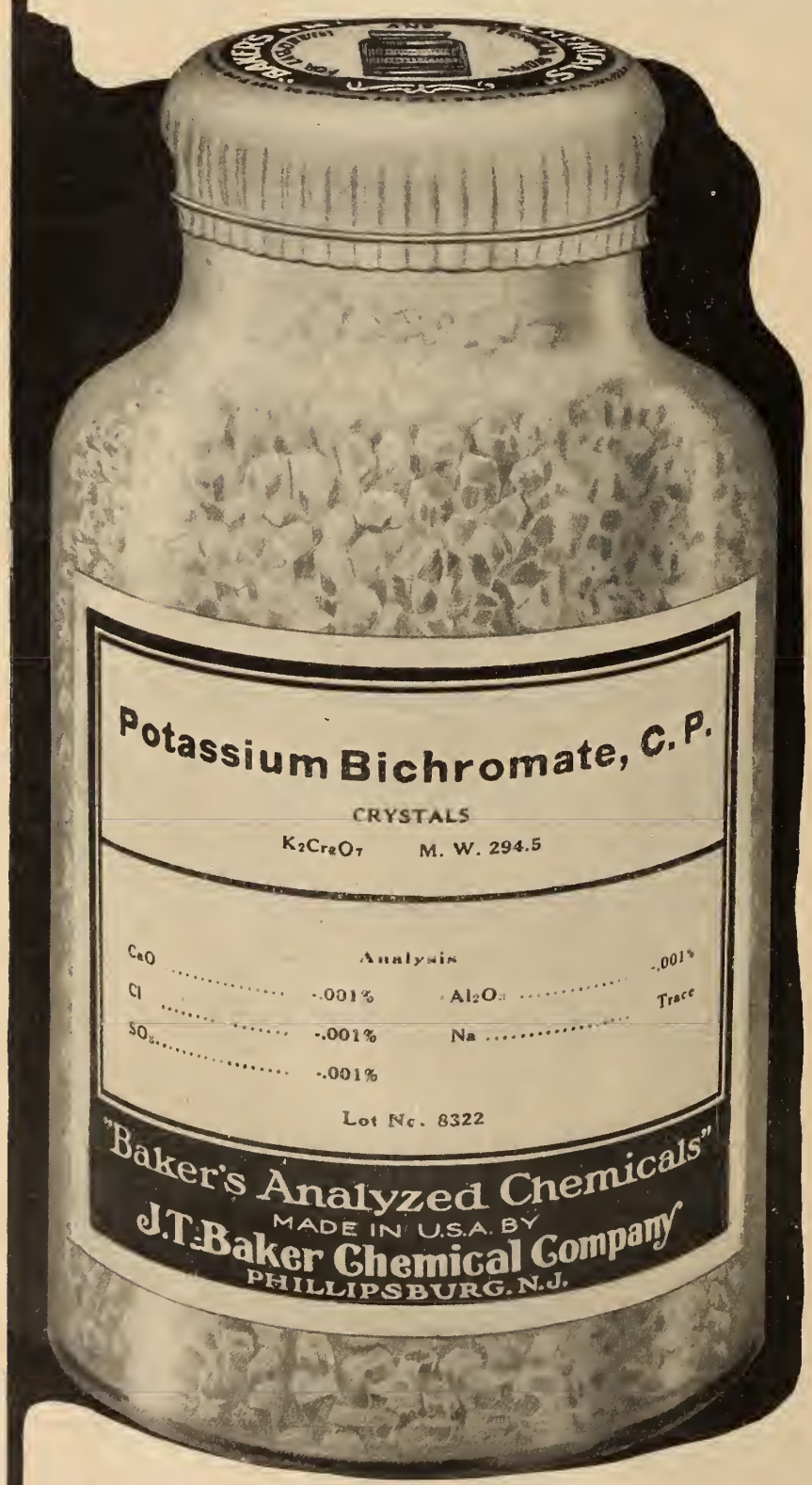

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EDITORIALS

POTENTIAL BUSINESS VALUE OF THE TECHNICAL EXECUTIVE

WE have here a message for the manufacturer and for the sales manager whose aim is to do better business and more of it.

Last month we suggested to technical men that a field of endeavor awaited them on the commercial side of industry. An earlier editorial comment was to the effect that we might all gain much more from our efforts for business if the management fully realized how far a knowledge of technical and labor problems could enter into the balance-sheet. Let us develop a suggestion which might help.

Recently we read that Dr. C. E. Mees was appointed to the board of the Eastman Kodak directorate. Following what the Eastman Company directors have done in a big way, we suggest that our manufacturers do in a minor way with lesser offices.

To those manufacturers and merchants, who have not yet fully considered this, we wish to suggest that they should whenever possible secure the services of a technical man to take care of the inside organization of such offices as Purchasing and Costing, and for all Sales positions, selecting, of course, men of aptitude for the particular branch. There are graduates to be found who are willing and able to give efficient service and with an ambitious spirit. In some cases it will be necessary for someone to drop out before a change can be made. In many cases, however, a change could be profitably made without further delay. And in the selling force you could perhaps make a pioneer addition which will produce new business, or at least will spread the gospel of your product in a sensible manner.

We have met men appointed as salesmen, sometimes from first class firms, whose only knowledge of a special alloy was the information printed on the price sheet. The prospective buyer was evidently expected to do the digging for further information. If confronted with a close cross-examination for details of how such an alloy would perform under certain circumstances, the representative could not say. The buyer's interest is either lost or suffers a set-back. A salesman trained with metallurgical and chemical knowledge would not only have answered the questions but probably would also have offered further useful suggestions.

We feel that we should appeal to manufacturers to consider these prospects very carefully. We have appealed to the men who are ready and anxious to serve in this wide field. These men have mental equipment acquired after years of special study. This knowledge should be applied at every possible point of the industry. It is surely a better proposition to apply such trained knowledge to purchasing, cost accounting, selling and like positions than to accept office men whose technical understanding is, to say the least, somewhat weak upon which to leave the building of a business whose base is technology.

These remarks are made with due respect to the present holders of the indicated offices. But to succeed we must do better, and we believe that all will agree that the foundations for better business would be firmer if based upon men with a trained knowledge of science as applied to modern production, and the extension of trade.

POSSIBLE INSTITUTE OBJECTIVES

BY-LAWS and such obvious mechanical arrangements have about served their turn as objectives for the activities of members of the Canadian Institute of Chemistry. They are fundamental matters, and the Institute will always be concerned with the legal status of the chemist, his right to a distinctive name, and a variety of other important, general matters of this nature. In this connection, it is only necessary to carry on the work now under way.

At the same time, the Institute must develop along other lines, to maintain the full, active interest of all present members, and increase the membership.

First, there is the detail of a code of ethics or principles. These are of standard type, and possibly have filled a need in many organizations, because they express general truths. Perhaps the universal regard for form and ritual has something to do with this desire.

Chemists are frequently presented with contract-forms. These have always been designed in the past by the employer. It has been suggested that some standard form could be developed by chemists themselves.

A matter of still more importance, and broader value, would be the bringing together, within the Institute, of all those companies and individuals acting in a general consulting capacity, as chemists and chemical engineers. This would be a very practical and helpful thing, that has so far remained undone. A consulting chemists' section of the membership would find much of value with which to concern itself.

A still larger group of individuals are primarily interested in the teaching of chemistry. There is an opportunity within the Institute to bring

together the teachers of chemistry in our Universities, Technical and High Schools, throughout the provinces. If the Institute desires, in any way, to play a helpful part in developing the teaching of the science, contact with teachers must be maintained.

Such activities would give the Institute definite and useful aims, would broaden out its sphere, and generally produce action on vital matters, whenever action and guidance became necessary.

ARTIFICIAL SILK

ARTIFICIAL silk is the rather inappropriate name given to a product of cotton or wood fibre which differs both physically and chemically from the gum of the silk worm. So long as it is called "artificial" a certain prejudice against its use is bound to exist, as was the case with cotton in its early days when it was looked upon as a substitute for linen. Cellulose silk—a more fitting term—is a commodity in a class of its own, and of indisputable value. The world's present output, though nearly twice that of pre-war days, is far from sufficient to meet the demand, and the industry, wherever carried on, is enjoying a prosperity that suffered no interruption even in the 1921 period of general business depression. The great artificial silk firm of Englnad, Courtaulds, Limited, reported a net profit for 1922 of £3,018,431 which compares with £1,684,593 in 1921 and £1,804,796 in 1920.

Of the four processes in common use for the making of cellulose silk, the most popular is the viscose which is an entirely British discovery, depending upon the formation of a soluble xanthate compound. The raw material for this process is wood pulp, and the principal chemical reagents caustic soda and carbon bisulphide. The viscose factories in Europe draw their supplies of sulphite pulp from Scandinavia and Canada. It is the labor, however, not the raw material that constitutes the heaviest item of cost; but this will not be so much in evidence when the present machinery is improved and additional mechanism applied.

The possibilities of cellulose silk appear to be almost limitless. It is extensively used in the braiding and millinery industries; and woven with real silk, wool, cotton or other fibres, it is gaining in importance every day in the manufacture of wearing apparel and of beautiful textures of all kinds. Ribbon straw, artificial horsehair, cloth, and even imitation Smyrna rugs and Gobelin tapestries are now made in artificial silk plants. Though not a substitute for natural silk, cellulose silk has a broad market on account of its comparative cheapness, and the world's output will soon exceed that of cocoon silk. The chemistry of cellulose offers unlimited scope for research, so new developments can be looked forward to that will still further extend the use of cellulose silk.

In view of the finance minister's tariff recommendations and the trading advantages Canada has with some countries through her preferential tariffs, the time would appear to be opportune for examining fully into the feasibility of establishing the cellulose silk chemical industry in Canada. Sulphite pulp and the necessary chemicals can be manufactured cheaply, and our domestic market is not insignificant as statistics for 1922 reveal that over $2,000,000 was expended on imports of cellulose-silk yarn and filaments, about $1,000,000 on manufactures from the United States and the United Kingdom alone, and large quantities—not to be identified in trade figures—of fabrics from these and other countries.

Just as we go to press we learn that the large British firm of Courtaulds has decided to establish a plant near Quebec City for the manufacture of artificial silk yarn. Truly we are getting on.

OFFICIAL ANALYSTS

OFFICIAL analysts have lacked organization in Canada heretofore, and the fact that the Dominion Government called together representative analysts, for conference on the matter of uniform official methods, was something of an event.

Quite some time ago, the Dominion Government contracted for such analytical work as was necessary, and the system of Public Analysts seemed about to flourish. Then followed a centralization policy, where practically all analysts doing work for the Government, were either public analysts, or official analysts employed on full time by the Government only. The system was carried out to the point where a fairly extensive special examination was given for public analysts. In the meantime, the number of chemists employed in official analytical work by provinces and cities has increased.

Now broader lines are being surveyed, and the significance of the recent meeting rests in the establishment of a new association. This will correspond broadly to the Association of Official Agricultural Chemists of the United States and the Society of Public Analysts in Great Britain.

In questions of food and drug standards, and the development of similar legislation, we have always been greatly influenced by American and European standards and methods of analysis. This has saved us from much research but has tended to make us inactive followers, rather than leaders.

The new association promises to be a working group of chemists, and if this is the result, it will

do much to stimulate research along these lines in Canada. We have our own national products and problems, and all chemists employed by state organizations should co-operate continually, with a view to the adoption of uniform official methods. It is a new departure and a very excellent one.

STEEL—COMBINATION NOT DISINTEGRATION

OUR contemporary, *Chemical and Metallurgical Engineering*, in a recent issue, has a timely article by Bradley Stoughton on the subject of current practice in electric steel making. There is also an editorial in the issue referred to which raises some important questions about future progress in steel making.

Reading these two items together one gathers that all is not well with the metallurgical side of modern steel making. Is it a marking-time, a parting of the ways, or a mixture of selfish motives?

Our friends quote a well-known metallurgist with the Steel Corporation (U.S.A.) as saying that "only through unremitting and untiring research can chemistry continue to serve the steel industry as it has in the past." There seems an ominous sound in that statement, and considering the size and importance of the industry it behooves those closely interested to do some thinking. What are we doing, and where are we going?

Differences of opinion should be cleared up by frank discussion, and methods standardized in the light of new knowledge unselfishly displayed. Or would this be too much to expect from some involved interests? It should be remembered that the steel industry is basic and plays an important rôle—upon it rests the progress of many other forms of activity.

High quality and economy in manufacture all depend on the human element engaged, whether in research or at work. Just as the finished product has to be perfectly homogeneous, so we hope that the endeavors meanwhile will be toward a good homogeneous mixing of brains and a unity of purpose, with the motto "Progress" always before the industry.

A SIGNIFICANT TRIP

INVASIONS of mining and metallurgical engineers from the United States are always welcomed by Canada.

There is something very significant about the plans of the summer trip of members of the American Institute of Mining and Metallurgical Engineers during the last week of August. From Toronto to Sudbury, Cobalt, Kirkland Lake, Iroquois Falls, Porcupine, and then to Quebec City, via Cochrane, and back to Thetford Mines and Montreal, will give considerable opportunity to gather in first-hand impressions of outstanding mining districts in Ontario and Quebec.

Such an interest in Canadian developments is striking proof of their importance to the rest of the world, and ourselves. Canada needs the publicity she receives regarding her agricultural resources, her beautiful lakes and rivers, her summer homes; but she also needs the sound advice that technically-trained minds will give to foreign capital, after they have investigated for themselves the particular opportunities they have seen.

After such a trip, Canada should not be a one-dimension country to these visitors but will have added some thickness at least. Let us hope that we have a fair, average sample of summer weather, so that the party may regret bringing their fur-coats, when four hundred miles north of imaginary lines. But we forget our visitors are expert, seasoned, mining technologists. They know Canada from the mining standpoint much better than most Canadians. We are sure they will be made very welcome at the mines and mills they visit.

WELL KNOWN MINING ENGINEER PASSES

Major-General R. G. Edwards Leckie died at St. Paul's Hospital, Vancouver, B.C., on June 22nd, after a serious operation. He was born in Nova Scotia in 1869, and was the eldest son of the late Major R. G. Leckie, who for many years was manager for the Londonderry Iron Company, subsequently connected with the Oxford Copper and Nickel Company, of New York, and was successively president of the American Institute of Mining Engineers, the Mining Society of Nova Scotia, and the Federated Canadian Mining Institute. Major-General, or "Bert" as he was familiarly known, Leckie, followed his father's profession, and was connected with mining enterprises in Nova Scotia, Ontario, British Columbia, and the State of Washington. Like his father, he was deeply interested in Canadian militia activities, and the call of his country during the South African and the Great War seriously interfered with his career as a mining engineer. He served his country with marked distinction, received several decorations, and rose to the rank of major-general. He was wounded in Flanders in 1917, invalided home, and after recovery was appointed O.C. at Victoria, B.C., until demobilization in 1920. He was appointed mining engineer on the commission appointed by the Provincial Government to investigate the cost of coal production in British Columbia, and for the last year has been manager of the Windpass Mining Company, which is developing a gold mine at Chu Chua, near Kamloops, B.C.

GERMAN PATENT CLAIMED FOR PRODUCT SIMILAR TO INSULIN

In 1912 a United States patent was granted to a German chemist, which it is said in general language describes a process and product virtually akin to Insulin and its method of production. Francis P. Garvan, head of the Chemical Foundation which acquired the rights to thousands of American patents issued to Germans and which had been seized during the war, submitted the patent to a number of chemists. After carefully going over it, they were disinclined to say that it specifically recorded a process similar to that used for the production of Insulin, but they declared in more than a general way that the two were alike.

The Uses of Carbon Dioxide---I.*

Methods of Manufacture and Marketing—Uses in Food Products Industry—Low Temperature Applications

By CHARLES L. JONES†

CARBON dioxide touches human activities probably more closely than any other gas. The natural use of carbon dioxide in photosynthesis is almost as old as life itself, and recent years have seen this commonest of gases applied in many novel ways, a brief summary of which is the purpose of the present article.

It is the author's purpose to deal particularly with the application of liquefied carbon dioxide in industry, but it is impossible to distinguish clearly between the fields of application of the liquefied gas and the fields of application of low-pressure carbon dioxide, either as such or in the form of flue gases. The reason for this is obvious, for users not requiring high-pressure carbon dioxide will nevertheless find it economical to buy the liquefied product, unless their requirements become so great as to warrant the comparatively high investment necessary to prepare and purify their own gas. Thus a given use in small units may be a use for liquefied carbon dioxide; the same use in larger units may be served by low-pressure carbon dioxide made on the spot. Transportability, permenance or temporary nature of gas requirements, convenience, immediate availability, pressure required, amount used, and purity are important factors necessitating the use of liquefied carbon dioxide in many cases where low-pressure gases might theoretically be used. Hence the author has attempted in the accompanying chart of uses to give an approximately complete picture of the field of applicability of carbon dioxide, including even some familiar uses of flue gas carbon dioxide, to which the liquefied product is not applied, such as, for example, the precipitation of alkali metals in the sugar industry.

It is difficult, if not impossible, to present accurate figures showing the relative amounts of liquefied carbon dioxide used for the various purposes, but a fair perspective may be obtained from the statement that of the total production of the 43 establishments in 1921 in the United States, about 90 per cent. went into the manufacture of carbonated beverages, a half-dozen other uses taking about one per cent. each and the remainder being distributed among various uses which require only small quantities. It should be pointed out, however, that some of the smallest uses in point of quantities consumed are of the greatest public importance. Certain smaller uses, such as the use in mechanical refrigeration, are growing rapidly and give promise of increased use in the future.

Manufacture of Liquefied Carbon Dioxide

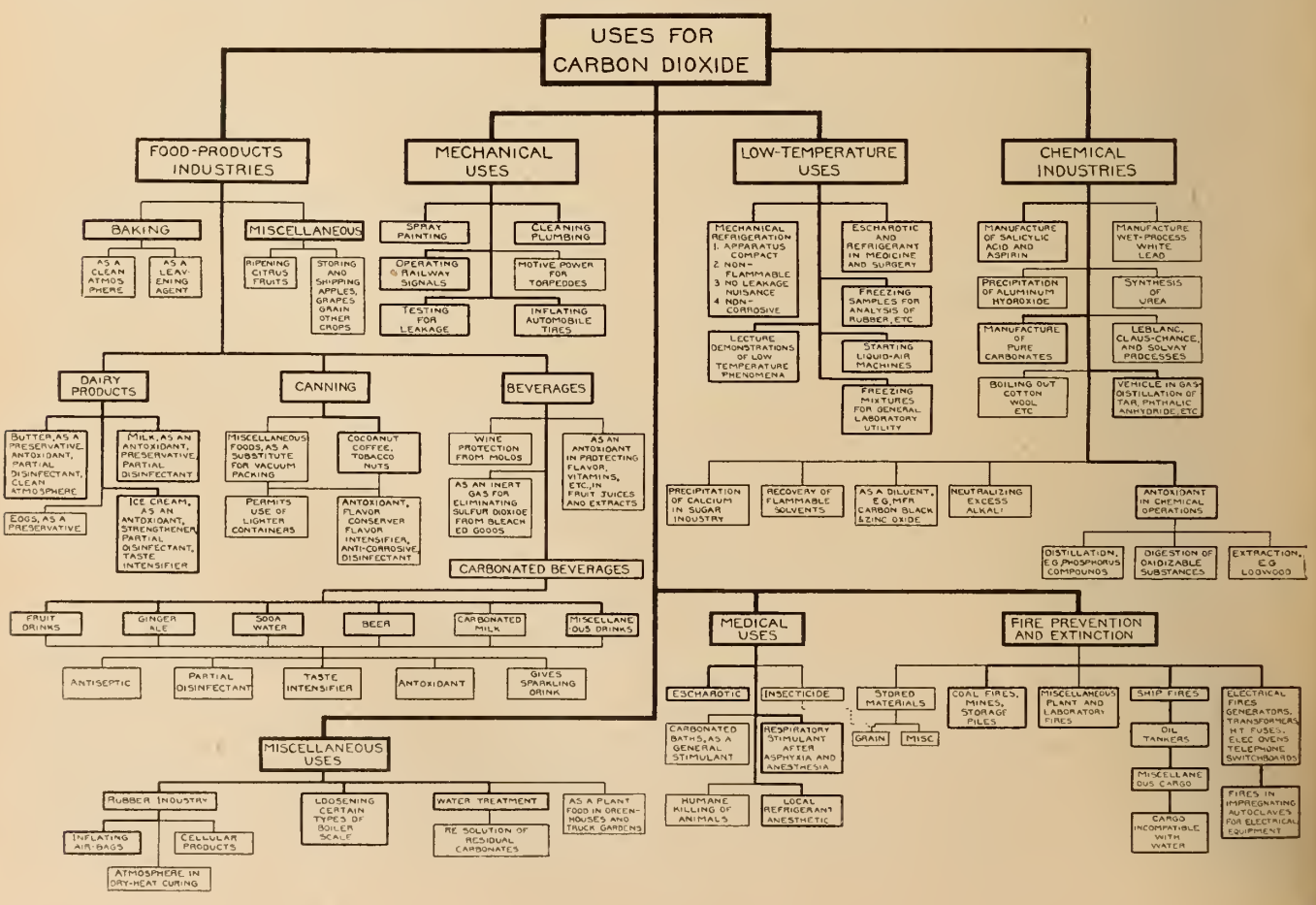
Most of the liquefied carbon dioxide coming upon the market is manufactured by the combustion of coke. Recent contributions to the literature give a good general idea of the outstanding features of this process.[1] Briefly, it may be stated that coke is burned under boilers, which are used to furnish power for compression of the purified carbon dioxide and to furnish heat for its separation from the alkaline carbonate solutions that absorb it from the flue gases.

Some carbon dioxide is recovered by one company from fer-

*This article will appear in two instalments, of which this is the first. Part II will appear in our August issue.

†Industrial Fellow, Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa., Research Chemist for the Carbon Dioxide Division, Compressed Gas Manufacturers' Association.

[1]See especially Chem. Met. Eng., 23 (1920), 346-7, idem, 28 (1923), 5.


USES FOR CARBON DIOXIDE
FOOD-PRODUCTS INDUSTRIES
MECHANICAL USES
LOW-TEMPERATURE USES
CHEMICAL INDUSTRIES
BAKING
AS A CLEAN ATMOSPHERE
AS A LEAVENING AGENT
MISCELLANEOUS
RIPENING CITRUS FRUITS
STORING AND SHIPPING APPLES, GRAPES, GRAIN, OTHER CROPS
SPRAY PAINTING
CLEANING PLUMBING
OPERATING RAILWAY SIGNALS
MOTIVE POWER FOR TORPEDOES
TESTING FOR LEAKAGE
INFLATING AUTOMOBILE TIRES
MECHANICAL REFRIGERATION 1. APPARATUS COMPACT 2. NON-FLAMMABLE 3. NO LEAKAGE NUISANCE 4. NON-CORROSIVE
ESCHAROTIC AND REFRIGERANT IN MEDICINE AND SURGERY
FREEZING SAMPLES FOR ANALYSIS OF RUBBER, ETC
STARTING LIQUID-AIR MACHINES
LECTURE DEMONSTRATIONS OF LOW TEMPERATURE PHENOMENA
FREEZING MIXTURES FOR GENERAL LABORATORY UTILITY
MANUFACTURE OF SALICYLIC ACID AND ASPIRIN
MANUFACTURE WET-PROCESS WHITE LEAD
PRECIPITATION OF ALUMINUM HYDROXIDE
SYNTHESIS OF UREA
MANUFACTURE OF PURE CARBONATES
LEBLANC, CLAUS-CHANCE, AND SOLVAY PROCESSES
BOILING OUT COTTON WOOL ETC
VEHICLE IN GAS DISTILLATION OF TAR, PHTHALIC ANHYDRIDE, ETC
DAIRY PRODUCTS
BUTTER, AS A PRESERVATIVE, ANTIOXIDANT, PARTIAL DISINFECTANT, CLEAN ATMOSPHERE
MILK, AS AN ANTIOXIDANT, PRESERVATIVE, PARTIAL DISINFECTANT
EGGS, AS A PRESERVATIVE
ICE CREAM, AS AN ANTIOXIDANT, STRENGTHENER, PARTIAL DISINFECTANT, TASTE INTENSIFIER
CANNING
MISCELLANEOUS FOODS, AS A SUBSTITUTE FOR VACUUM PACKING
COCOANUT COFFEE, TOBACCO NUTS
PERMITS USE OF LIGHTER CONTAINERS
ANTIOXIDANT, FLAVOR CONSERVER FLAVOR INTENSIFIER, ANTI-CORROSIVE, DISINFECTANT
BEVERAGES
WINE PROTECTION FROM MOLDS
AS AN INERT GAS FOR ELIMINATING SULFUR DIOXIDE FROM BLEACHED GOODS
AS AN ANTIOXIDANT IN PROTECTING FLAVOR, VITAMINS, ETC., IN FRUIT JUICES AND EXTRACTS
CARBONATED BEVERAGES
FRUIT DRINKS
GINGER ALE
SODA WATER
BEER
CARBONATED MILK
MISCELLANEOUS DRINKS
PRECIPITATION OF CALCIUM IN SUGAR INDUSTRY
RECOVERY OF FLAMMABLE SOLVENTS
AS A DILUENT, E.G. MFR CARBON BLACK & ZINC OXIDE
NEUTRALIZING EXCESS ALKALI
ANTIOXIDANT IN CHEMICAL OPERATIONS
DISTILLATION, E.G. PHOSPHORUS COMPOUNDS
DIGESTION OF OXIDIZABLE SUBSTANCES
EXTRACTION, E.G. LIGNOSO
ANTISEPTIC
PARTIAL DISINFECTANT
TASTE INTENSIFIER
ANTIOXIDANT
GIVES SPARKLING DRINK
MEDICAL USES
ESCHAROTIC
INSECTICIDE
CARBONATED BATHS, AS A GENERAL STIMULANT
RESPIRATORY STIMULANT AFTER ASPHYXIA AND ANESTHESIA
HUMANE KILLING OF ANIMALS
LOCAL REFRIGERANT ANESTHETIC
FIRE PREVENTION AND EXTINCTION
STORED MATERIALS
GRAIN
MISC
COAL FIRES, MINES, STORAGE PILES
MISCELLANEOUS PLANT AND LABORATORY FIRES
SHIP FIRES
OIL TANKERS
MISCELLANEOUS CARGO
CARGO INCOMPATIBLE WITH WATER
ELECTRICAL FIRES GENERATORS, TRANSFORMERS, H.T. FUSES, ELEC. OVENS TELEPHONE SWITCHBOARDS
FIRES IN IMPREGNATING AUTOCLAVES FOR ELECTRICAL EQUIPMENT
MISCELLANEOUS USES
RUBBER INDUSTRY
INFLATING AIR BAGS
CELLULAR PRODUCTS
ATMOSPHERE IN DRY-HEAT CURING
LOOSENING CERTAIN TYPES OF BOILER SCALE
WATER TREATMENT
RE-SOLUTION OF RESIDUAL CARBONATES
AS A PLANT FOOD IN GREENHOUSES AND TRUCK GARDENS

mentation vats in the manufacture of industrial alcohol. This fermentation gas must be treated by a special process to remove odors before compressing into cylinders for the trade. A smaller amount is produced from mineral springs but this once important source now furnishes less than one per cent. of the annual output.

Carbon dioxide is sold on a weight and not a volume basis, and appears almost altogether in 20-pound and 50-pound cylinders. Having been charged by weight, the amount charged is regulated in relation to the capacity of the cylinder in such a way as practically to eliminate risk in all ordinary operations. The pressure found in the cylinders is in general the vapor pressure of carbon dioxide, shown graphically in Figure 1;

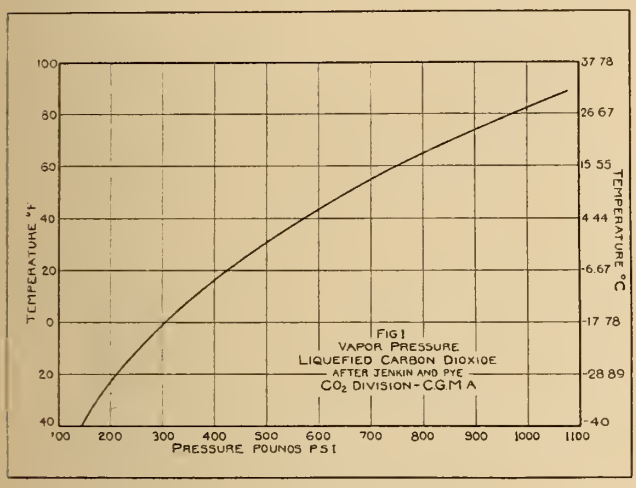


FIG 1
VAPOR PRESSURE
LIQUEFIED CARBON DIOXIDE
AFTER JENKIN AND PYE
CO_2 DIVISION - C.G.M.A.

but on warming above 88°F., the critical temperature of carbon dioxide, the pressures continue to rise. At 120°F., however, the pressure is but 1550 pounds per square inch, as compared with a release pressure for the safety device of 2,700 pounds per square inch, and a rupturing pressure of the cylinders greatly in excess of 3,000 pounds per square inch.

A point making for the convenience of the chemical engineer is the use of half-inch standard pipe thread outlet on all cylinders, in contrast to practice with other gases. As with all compressed and liquefied gases, transportation charges and difficulty with return of cylinders, which represent large capital investment, are important cost factors in the industry, but it should be pointed out that, on account of the volume ratio of carbon dioxide, shipping weight per cubic foot of gas delivered is much less than for compressed gases not liquefied.

The cooling effect of the expanding gas when carbon dioxide is withdrawn from the cylinder is considerable, and furnishes the basis for the preparation in the laboratory of carbon-dioxide snow, an easy and convenient means for reaching temperatures near its sublimation point (approximately -110°F. at 750 mm.). This cooling effect sometimes results in stoppage of valves and lines with carbon-dioxide snow, and in the past this has limited the application of carbon dioxide in certain cases. However, means have been found for avoiding the difficulty and it is usually possible to deliver the gas with good dependability in the quantities and in the manner desired. The author is prepared to assist users, where possible, with discharge problems.

Like most simple and familiar chemical substances, carbon dioxide may function in a variety of ways, and occasionally it has found application in strange manners and places. It is of historical interest to note, for example, that a German inventor in 1895 built an airplane equipped with a motor actuated by carbon dioxide from a small cylinder. At the time of these early experiments, the inventor believed his apparatus to be the lightest prime mover available per horse-power developed and succeeded in causing his machine to fly short distances.[2]

A number of uses are shown in the chart accompanying this article, the discussion of the various uses in the text following rather closely the classification shown in the chart. The chart has been prepared with heavy lines leading to each actual present use for liquefied carbon dioxide, lighter lines being used for obsolete uses and those to which liquefied carbon dioxide is not known to be applied in the United States.

Carbon Dioxide in the Food Products Industries

On account of its purity, its non-oxidizing quality, its inhibitive and partial disinfecting action on certain bacteria, and its ability to stimulate taste sensation, carbon dioxide has found application in various ways in the food-products industries. Its principal outlet in this field is, of course, in the manufacture of carbonated beverages.

While the primary reason for carbonating beverages is to give the public what it wants by improving the taste of certain beverages, and by improving the appearance and imparting sparkle and "life" to them, carbon dioxide exercises other functions no less important. It is recognized that carbon dioxide has a marked stimulating effect on the olfactory and gustatory nerves, accentuating flavors, and making the senses more delicately perceptive. One large company claims the use of smaller quantities of flavoring material where carbon dioxide is present, with the same apparent concentration of flavor. Although not sold for its bactericidal action, carbon dioxide exercises important functions iin keeping down the bacterial counts of carbonated beverages[3]. The bacterial count is steadily reduced on standing in all cases, the degree depending upon the number and kind of bacteria originally present, the degree of carbonation, the temperature, and the presence or absence of other substances, such as fruit acids, which may also exert some inhibitory action. Most certainly carbon dioxide is not a panacea for unsanitary methods of manufacture, and indeed certain molds thrive in it, and it is entirely ineffective against spores. But, with the single exception of spore-formers, all pathogenic bacteria which have been studied in this connection to date, are rapidly reduced in number and in some cases entirely destroyed by carbon dioxide at carbonating pressures. Therefore carbonation may be considered a valuable presumptive indication of the safety of a beverage as compared with the water from which it has been made. The psychological refrigerant effect in carbonated beverages should also be noted here; thus, a carbonated drink will produce the sensation of being cooler than an uncarbonated drink at exactly the same temperature, although this statement is not capable of direct proof.

Carbon dioxide has found other outlets in the food-products industries which are of growing importance. The tendency of flavors and odors to become oxidized and destroyed has long been recognized, and, as is well-known, vacuum packing has recently been applied successfully to the solution of this problem. Carbon dioxide may be used to serve the same purpose and has all the advantages of vacuum pack, with the additional advantages that the strength of the package need not be great, and that extremely small leaks may not defeat the purpose of the canning by admitting oxygen, since there is no considerable pressure difference between the inside and outside of the can[4]. At least one brand of shredded cocoanut and one of walnuts are put out packed in carbon dioxide, and more products so packed may be expected shortly to come upon the market. Certain products when packed in air give rise to oxidation products with a corrosive effect on the containers, and, of course, carbon dioxide obviates this trouble.

Carbon dioxide has been used experimentally in the case of easily oxidized food materials for the protection of vitamins

2 z.f.d. ges. Kohlensaure Industrie, 2 (1896), 507.

3 See, for example, Bull. 192, Ky. Agr. Exp. Sta.. 1915.

4 Chem. Age (N.Y.), 30 (1922), 74.

from oxidation; for example, in protecting the vitamins in orange juice. It was used with a somewhat different purpose in a large scale trial for the protection from spoilage of California grapes in transit during 1922. It is the writer's understanding that preliminary experiments on grape storage were very encouraging, but the larger scale trial left much to be desired because of the poor initial condition of the grapes shipped. Large scale experiments in England have shown that carbon dioxide has a beneficial effect on apples in storage, and the results indicate probable future storage of apples in atmospheres containing up to 15 per cent. of carbon dioxide[5]. The presence of carbon dioxide is said to hasten the ripening of citrus fruits, and combustion gases from kerosene stoves have been used for accelerating the ripening of Florida oranges[6].

Bread[7] leavened by kneading dough under pressure with carbonated water and relieving the pressure was at one time sold in England, but is not made at present. More recently carbon dioxide has been proposed as a convenient inert medium for displacing the air from bread machinery, thus eliminating the dust and bacteria carried by the air of the room. In the dairy and ice-cream industries carbon dioxide has found wide application. When air is excluded in the churning of butter and carbon dioxide is substituted therefor, oxidation of the butter by occluded gases is impossible, and the time of becoming rancid is said to be considerably delayed.

A much wider use at the present time is the manufacture of ice cream[8]. In the ice cream industry carbon dioxide is substituted for air as the atmosphere in the freezer, and hence the gas beaten into the mix, usually about 100 per cent. by volume, is carbon dioxide instead of air. The substitution of carbon dioxide for air unquestionably gives added mechanical strength to the resulting ice cream, probably because of the greater solubility of carbon dioxide over air, and the fact that in the freezing dissolved gases are expelled. Some additional swell in the hardening room is also imparted. Insofar as carbon dioxide replaces the ordinary atmosphere of the room, it excludes the dust and bacteria carried by the atmosphere under even the best conditions. It prevents oxidation and is claimed to thus preserve vitamine. It is claimed to accentuate flavors, improving good flavors as well as strengthening disagreeable ones. It has some bactericidal action, but the extent of this action has been the subject of a controversy which is as yet unsettled[9]. The decrease of micro-organisms normally growing at body temperature in carbonated ice cream seems greater than the decrease in those growing at lower temperatures. It has been claimed by the opponents of carbonation for ice cream that carbon dioxide acts only through the mechanism of hydrogen-ion concentration[10], to which the proponents reply that the effect and not the mechanism is of primary importance.

A number of processes have been proposed for the preservation of milk[11] and eggs[12] by means of carbon dioxide, but none of these has yet received trial on a scale sufficient to define its commercial possibilities. As an inert gas, it has been proposed for eliminating residual sulphur dioxide from bleached liquids by blowing[13].

Low-Temperature Uses

Carbon dioxide enters in various ways into the production of low temperatures, its principal application being as a refrigerant in mechanical refrigerating systems. Its outstanding advantage for this purpose is the safety from fire, explosion, and disagreeable physiological effects afforded by its use. Largely because of these advantages it is at the present time undergoing a very rapid growth in popularity. It has its particular field in congested localities, and is applied in office buildings, hotels, hospitals, and on shipboard, usually in connection with the indirect system of brine circulation. Macintire[14] states that centralization of piping is thus made possible, allowing the use of common black pipe. "An escape into the air of a charge of carbon dioxide is not so disagreeable or subject to such unfavorable notice as ammonia would be. As it is much heavier than air, it will not rise except by diffusion, and guests or tenants are not driven out of their rooms." Unlike most other refrigerants it is not combustible nor will it form explosive mixtures with air. Despite greater pressures used in the carbon dioxide system, the power required per unit of refrigeration is about the same as with other refrigerants. Under the conditions existing in refrigerating systems, carbon dioxide is non-corrosive. Further, the carbon dioxide machine is economical of space, being much less bulky than low-pressure refrigerating machines of corresponding capacity.

In the laboratory, carbon dioxide snow, produced by simply allowing carbon dioxide to escape from an inverted cylinder and collecting the snow in a suitable container, may be used for producing temperatures above its sublimation point (—78.2° C., or —108.8° F.). Mixed with ethyl alcohol, ethyl ether, or other organic solvents, it is a useful cooling medium in the laboratory for traps, condensers, etc. In chemical analysis it is of use in making soft or pliable substances, such as rubber, brittle, thus permitting the pulverizing of samples for analysis. In histology it is utilized in freezing specimens for the cutting of microscopic sections. It has been used for starting other low-temperature apparatus, such as liquid-air machines. Teachers of chemistry employ it as a cooling agent in demonstrating various low-temperature phenomena.

5. Reports of the Food Investigation Board, Department of Scientific and Industrial Research, London, for the years 1920 and 1921.
6. Hawkins, Florida Grower, 25 (1922).
7. Z.f.d. ges. Kohlensaure Ind., 3 (1897), 76.
8. Kirkpatrick, Swordling, and Heath, U.S. Patent 1,329,246).
9. The author has a record of 45 pieces of original research on the bacteriological action of carbon dioxide, showing on different organisms effects varying from none whatever to inhibition and even sterilization. In general, as would be expected, pathogens are most easily eliminated by carbon dioxide, except spore-forming types.
10. Report of L. F. Rettger on "The Influence of Carbon Dioxide on Bacteria," to the National Association of Ice Cream Manufacturers, 1922.
11. For example, see Nourry and Michel, Comp. rend., 115 (1892), 959; and Chem. Age (N.Y.), 30 (1922), 53.
12. Lescarde, U.S. Patent 1,011,352.
13. R. F. Bacon, U.S. Patent 1,305,244.
14. Macintyre, "The Principles of Mechanical Refrigeration," McGraw-Hill, 1922, p. 159.

TORONTO SECTION ELECTS OFFICERS

The following are the officers of the Toronto Section of the Society of Chemical Industry, for the term 1923-24'—

Chairman: Prof. J. T. Burt-Gerrans, University of Toronto.
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EUCALYPTUS OIL AS MOTOR FUEL.

The Australian Commonwealth Government is interesting itself in the experiments of Captain C. M. Dyer with eucalyptus oil as a motor fuel. He claims to have established that eucalyptus oil can be used in petrol engines, with efficient means of vaporization. The only difficulty is that it will not start an engine from cold without priming. On the other hand, the calorific value is high. Tests made with cheap cars are reported to have shown that a run on gasoline gave twenty-four miles to the gallon; on half-gasoline and half-eucalyptus oil, twenty-eight miles; and on eucalyptus oil alone, thirty-six miles. He states that eucalyptus oil will mix with gasoline, benzol and alcohol, and that it acts as a decarbonizing agent, maintaining cylinders and pistons free from carbon.

There are 170 varieties of eucalyptus in Australia. The oil yields range from 0.02 to 35 lbs. per 1,000 lbs. of leaf treated. Distillation is a simple process, requiring no skilled labor. The main difficulty of manufacture on a large scale would be labor for gathering the leaves.

Iron and the Lower Oxides of Iron*

By JOHN BRIGHT FERGUSON[1]

THE elementary text-books tell us that iron forms three oxides, ferrous oxide (FeO), ferro-ferric oxide (Fe_3O_4), and ferric oxide (Fe_2O_3). Upon this assumption, many experiments have been carried out to determine the limiting strengths of various oxidizing mediums which would be in equilibrium with these oxides at different temperatures, while other investigations have been undertaken with the view of ascertaining if these are the only oxides which may exist.

Sosman and Hostetter[2], for example, measured directly the pressure of the oxygen which was in equilibrium with ferric oxide and also of the oxygen in equilibrium with various preparations intermediate in composition between this oxide and the ferro-ferric oxide. They concluded from their results that at 1,100°C. a series of oxides, ranging from ferric oxide to ferro-ferric oxide could be obtained in a stable condition.

Since the oxygen pressures of the lower oxides at reasonable temperatures are too small for easy measurement, other workers like Hilpert[3] or Matsubara[4], have determined the compositions of the solids which appeared to be stable in contact with known gas mixtures of hydrogen and water vapour or carbon monoxide and carbon dioxide at different temperatures and thus obtained an indirect measure of their oxygen pressures. From their measurements it would appear that intermediate oxides to ferrous oxide and ferro-ferric oxide also occur. Indeed, according to Hilpert, he could not prepare pure ferrous oxide at any temperature up to 1,100°C. On the other hand, Chaudron[5] has found that ferrous oxide decomposes below 570°C. to form iron and the ferro-ferric oxide.

The results of some of the investigators are unfortunately not in entire agreement. Sosman[6] expresses the view that there are no oxides intermediate between pure iron and ferrous oxide containing over a few tenths of one per cent. of oxygen, while Matsubara's work indicates that such oxides may contain up to six or seven per cent. of oxygen, Similarly there are wide discrepancies in the values assigned to the ratio of the water vapor to the hydrogen in the gas mixtures which are in equilibrium with a mixture of iron and ferrous oxide.

In what follows we wish to present evidence upon some of the points in dispute and also to shed additional light upon the difficulties encountered by Hilpert when he attempted to synthesize pure ferrous oxide.

I. The Iron Phase

Mixtures of hydrogen and water vapour were passed over samples of iron at high temperatures and the resultant degree of oxidation noted. Pure reduced electrolytic iron, piano wire and slightly oxidized electrolytic iron were used. The results of these experiments are given in table I.

Table I.

EXPERIMENTS ON THE NATURE OF THE IRON PHASE

Temp. Deg. Cent.	Time in hours	Ratio of water to hydrogen in gas mixture	Iron content per cent. Initial	Final
750	6	0.476	100	99.98
750	6	0.540	100	99.90
750	6	0.33	99.78	99.67piano wire
980	6	0.44	100	99.86
960	6.5	0.44	100	100.1
960-80	6	0.44	99.88	99.84

The fact that in the first five experiments no appreciable oxidation occurred and that in the sixth experiment a reduction of over one per cent. of oxygen took place, would seem to favor the earlier view that iron forms no oxides lower than the ferrous oxide.

II. The Ferrous Iron Phase

We prepared two samples of ferrous oxide using hydrogen-water-vapour mixtures and one sample using a carbon monoxide-carbon, dioxide mixture. The analyses are as follows:-

Sample	I.	FeO	78.16%
		Fe_2O_3	21.84%
Sample	II.	FeO	87.48%
		Fe_2O_3	11.80%
		Fe	0.72%
Sample	III.	FeO	84.65%
		Fe_2O_3	15.35%
		Fe	trace

Upon heating sample I. in a vacuum, no free iron developed in five hours at temperatures above 526°C. and, upon heating the converted material in vacuum, the iron set free below 526° C. began to recombine at 577°C. and had all recombined in five hours at 607°C.

When sample II. was so heated at temperatures between 620°C. and 546°C. about one and a half per cent. of iron was liberated. At temperatures below 546°C. a continuous liberation of iron took place if the temperature were not too low. Upon heating the converted material the free iron did not all recombine but even at 610°C. well over one per cent, was left after five hours of heating.

Sample III. behaved in a similar manner to sample II.

For the major reaction we may write the equation

$$4FeO \rightleftarrows Fe + Fe_3O_4$$

The total conversions possible in samples I. and II., calculated by means of this equation would be 13.3 and 16.7 per cent. We actually obtained conversions of 13.5 and 16.9 per cent. The materials may not have been exactly homogeneous and to this we attribute the slight differences found. The equation is evidently the correct one.

The minor reaction shown by samples II. and III. is probably the decomposing of a ferrous oxide into another ferrous oxide containing more ferric oxide and freeing iron.

If we assume that pure ferrous oxide is stable only at high temperatures but that its transition temperature is lowered by admixture of ferric oxide in a similar manner to the way that adding carbon to iron lowers the γ iron transition temperature we have at hand an explanation of our results and the results of Hilpert.

Sample I. decomposing in one reaction only, would have the composition of the ferrous oxide with the lowest transition temperature. In this connection it is of interest to note that Matsubara's results indicate that in the range 863–1175°C. the maximum ferric oxide content of the ferrous oxides is practically independent of the temperature. His ferrous oxide containing the maximum ferric oxide has an iron content of a little less than 76 per cent. while sample I. contains 76.03 per cent. total iron.

Hilpert was able to prepare at 700°C. a ferrous oxide containing 15 per cent. of ferric oxide and at 1,100°C. an oxide containing 1.5 per cent of ferric oxide. These represented his purest ferrous oxides for these temperatures. He was not sure if his inability to obtain purer oxides were due to the instability of the purer oxides or whether it were due to a slow reaction velocity. Since we have found that the purer oxides in two cases are unstable in respect to less pure oxides at the lower temperatures, we think that this factor is the main one to be considered in this case.

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* Abstract of Paper delivered before joint meeting Canadian Institute of Chemistry and Society Chemical Industry, May 29th, 1923, Toronto.

1. Associate Professor of Chemistry, Dept. of Chemistry, University of Toronto.
2. J. Am. Chem. Soc., 38, 807 (1916).
3. Ber., 44, 1608 (1911).
4. Trans. Am. Inst. Mining Met. Eng., reprint 1051 issued with Mining and Metallurgy, February, 1921.
5. Annales de Chemie, 16, 221 (1921).
6. J. Wash. Acad. Sci. 7, 56 (1917).

III. The Equilibrium Constants

A series of experiments was carried out at 750°C. with the view of checking by the stream method the diverse values which have been obtained for the equilibrium constant by the static method. A similar apparatus to that used for the work on the iron phase was employed. Blank experiments were carried out to test the apparatus and method.

Oxidation started with a gas mixture having a ratio of water vapour to hydrogen of probably slightly less than 0.54 and certainly less than 0.57. Chaudron's latest work leads to a value of 0.53 for this temperature. Eastman's[7] calculated value would be 0.441. That of Schriener and Grimnes[8] would be approximately 0.66. Our work appears therefore to check that of Chaudron.

Our rate experiments on the decomposition of ferrous oxide offer additional evidence against the last value quoted (S. and G.). From the series of equilibrium constants obtained by these workers at different temperatures one can determine the transition temperature of the ferrous oxide stable at that temperature at which ferro-ferric oxide and iron are also stable. This turns out to be 636°C. a value much in excess of the temperatures found by us even for the recombination to take place.

The work, thus briefly outlined, was to a large extent carried out by Messrs. Findlay, Robertson, Noble, Hoover and Mulligan and to them credit is due.

Work of Dominion Government Chemists—III.*

By F. C. COLLIER

Department of Health

HISTORY shows that the adulteration of commodities has been practised from the earliest ages. For instance, Pliny refers to the sale of bread containing white clay. The ancient Athenians suffered to such an extent by the adulteration of their wine that they found it necessary to appoint a special inspector of this product. We are not informed what methods this official employed to discover adulteration, but possibly he used tests similar to those of the ale taster of the Middle Ages. One of his methods for determining the purity of ale was to pour some of it on a wooden seat and then to sit on the wet place in his leathern breeches. If the residue on evaporation caused his breeches to be sticky, it was considered an evidence that the liquor was adulterated.

It is a far cry from the crude and spasmodic attempts of our ancestors to prevent adulteration to the present advanced systematic scientific methods of food and drug control which have been developed within the last fifty years.

The Ottawa Laboratory was established in 1885 under the control of the Inland Revenue Department, the work being directed by H. Sugden Evans, the first Chief Analyst. Under the competent direction of Chief Analyst MacFarlane and his able successor Dr. McGill, the work increased rapidly in variety and influence.

Protecting the Public Against Adulteration

This laboratory, which is at present under the control of the Department of Health, has now well-equipped branches located at Halifax, Montreal, Winnipeg and Vancouver, each in organic connection with the Central Laboratory at Ottawa. The latter has normally a staff of about ten analysts, while in each of the branches there is at present a senior analyst and one assistant. In order that the work of food and drug control may be carried out more effectively, the Dominion has been sub-divided into 25 districts, in each of which there is a resident inspector, who is required to familiarize himself with the conditions under which the commodities covered by the Acts the Department administers are imported, manufactured and sold. Suspected samples are forwarded to the nearest departmental laboratory for examination. If the Analyst finds the sample adulterated or misbranded, he issues a certificate to that effect, and should the Chief Analyst consider prosecution advisable, the inspector is notified accordingly.

In order that adulteration of a sample may be established, it is necessary to know the chemical characteristics of genuine commercial samples of that product and its limits of variability. For this reason, examination is constantly being carried out on large numbers of samples of known authenticity. When sufficient data has been accumulated a tentative standard is drawn up. This is submitted to interested parties as well as an advisory board. When approved by these, the standard is legalized, being promulgated by Order-in-Council.

While the main work of these laboratories is connected with the administration of the Food and Drugs Act, the Proprietary and Patent Medicines Act, and the Opium and Narcotics Act, practically all the technical work required in administration of the Dairy, Fertilizers and Feeding Stuffs Acts is also carried out. Even with a small staff during the last fiscal year over 5,400 samples were examined. These figures, of course, convey no intimation of the amount of work carried out on each individual sample, many of which required a number of long and difficult determinations.

In the period mentioned 225 prosecutions were entered for violation of the Food and Drugs Act alone. In addition to such prosecutions large seizures were made of food and drugs that were unfit for use. Instances of such were Chinese eggs and frozen oranges.

In connection with the administration of the Proprietary and Patent Medicines Act a large amount of work was carried out to determine if these remedies were in accordance with the terms of registration, and as a consequence a number of manufacturers were successfully prosecuted, the offences being chiefly for lack of medication in alcoholic preparations, and for employing scheduled drugs in excess of the portions permitted. In one instance eight thousand cases of an alcoholic tonic valued at over $40,000 were seized.

In addition to the work briefly outlined above much educative work has been carried out both by correspondence and by means of the publication of bulletins, 440 of these having been issued to date. The officials of these laboratories are always glad to furnish interested parties with the latest information regarding the composition and value of the foods and drugs on the market. Providing also that the work required does not conflict with the interests of commercial analysts they are also willing to assist manufacturers with their chemical problems.

It is satisfactory to observe that the efforts of the Government to increase the purity of food and drugs are meeting with considerable success. During the last couple of decades there has been a steady diminution in the number of cases of infractions of these laws. Much of the adulteration carried on to-day is not as directly injurious to health as was formerly the case, but generally concerns the pocketbook. Most of the intentional adulteration is practised for the purpose of cheapening the product in order to afford the producer a greater profit. In this work the better class of producers are co-operating.

7. J. Am. Chem. Soc., 44, 975 (1922).
8. See paper by Eastman.

*Paper presented at Ottawa Section, Society of Chemical Industry, January, 1923.

Artificial Silk*

With Special Reference to Canada as a Field For Its Manufacture

THE growing demand for artificial silk, the many new uses to which it is being made applicable, and the undoubted present prosperity of the industry, as revealed by recently published financial statements, make it well worth while to consider the feasibility of establishing an artificial silk plant in Canada, and the following somewhat general remarks have been prepared with this consideration in view.

Imports

Canadian imports of artificial silk yarns and thread are by no means insignificant considering the present small population of 8,788,483, having a value of $2,013,429 in the calendar year 1922. The United Kingdom, the United States and Belgium contributed to this amount $1,071,255, $397,429, and $377,136 respectively, the balance coming from Switzerland, the Netherlands, Germany, Sweden and France.

Present purchases of manufactured goods, wholly or mainly of artificial silk, from the United States and the United Kingdom alone, have a value of nearly $1,000,000; and increasingly large quantities—not to be identified in trade returns—of fabrics, partly made of artificial silk are brought in from these and other countries. The following table gives imports into Canada of yarns, thread, and filaments of artificial silk for the fiscal years ending March 31st, 1920, 1921 and 1922.

From	1920		1921		1922	
	lbs.	Value $	lbs.	Value $	lbs.	Value $
United Kingdom	278,886	1,037,540	301,348	1,179,213	285,778	695,173
United States	73,092	365,235	112,492	403,782	186,122	435,251
Belgium	6,391	27,248	73,903	366,247	59,673	142,336
France	1,928	6,715	24,366	87,900	939	1,807
Other countries	nil	nil	nil	nil	37,938	73,304
Total	360,297	1,436,738	512,109	2,037,142	570,540	1,347,871

During the year 1922 the Canadian imports of artificial silk yarn and thread were:—

Country	Pounds	Value $
United Kingdom	425,392	1,071,255
United States	158,092	397,429
Belgium	151,877	377,136
Netherlands	28,444	68,654
Switzerland	28,127	63,829
Germany	14,993	31,205
Sweden	1,001	2,300
France	760	1,620
	808,686	2,013,429

Processes and Raw Materials

The processes most commonly used for the manufacture of artificial silk are the nitrocellulose, the cuprammonium, and the viscose methods of treatment. The viscose process would appear to be the best for Canada on account of its comparative cheapness and the plentiful supply of cellulose material—some of which in the form of sulphite pulp is shipped to silk plants in France and Italy. A wood pulp freed from grease and bleached as for paper-making answers the purpose satisfactorily. The pulp is worked up with caustic soda and the resulting alkali-cellulose treated with carbon bisulphide in closed vessels. The viscous liquid is allowed to stand for several days, filtered, forced through fine capillary tubes into a coagulating bath, and then spun.

There are 25 companies manufacturing sulphite pulp in Canada of whom eight have plants in Ontario and nine in Quebec.

Chemicals

Unlike the nitrocellulose process which requires comparatively expensive chemicals such as nitric acid, ether and alcohol, the viscose uses mainly caustic soda and carbon bisulphide.

Caustic soda is produced in Eastern Canada largely at the plants of the Canadian Salt Company, Limited, of Windsor, Ontario.

Carbon bisulphide is not manufactured in Canada. Imports—all from the United States—for the year ending March 31st, 1922, were 64,356 pounds valued at $4,999.

Large scale production of carbon bisulphide is based upon a direct union of carbon and sulphur at a temperature from 600° to 1,000°C. The Taylor process or a modification of it would appear to be the most economical for the manufacture of this chemical in Canada owing to the facilities for procuring cheap electric power and willow or birch charcoal, which type of carbon, if of low ash content, is said to be the most successful for the process. Practically all the sulphur used in chemical industries in Canada is procured cheaply and in a very pure form from the American States of Louisiana and Texas. Canada, however, has extensive deposits of iron pyrites.

In England much progress has been made lately in the further development of artificial silk from cellulose acetate, and should this acetate silk be made in Canada, the low cost at which cheap electric power permits of the manufacture of synthetic acetic acid would be specially advantageous.

Acetic acid is produced in Eastern Canada by the following Canadian firms:—

Canadian Electro Products Co., Ltd., at Shawinigan Falls, Que.

Grasselli Chemical Co., Ltd., at Hamilton, Ontario.

Standard Chemical Co., Ltd., at various wood distillation plants in Ontario and Quebec.

During the nine months, April to December, 1922, the Dominion exported to the United Kingdom 31,429 cwt. of acetic acid, valued at $238,846.

Cost and Labor

It is not so much the cost of the wood pulp and the chemicals that determines the price of viscose silk as the wages paid the operatives—some of the world's largest factories employing 3,000 hands—men and women. As, however, the present machinery in artificial silk plants is said to offer much scope for improvement, a large reduction in the amount of hand labor, both skilled and unskilled, may be expected. Labor in Canada is certainly dearer than in England but cheaper at present (April, 1923) than in the United States. Most of the skilled workers would have to be brought from outside at the inception of the artificial silk industry in Canada; unskilled labor, however, could be secured in efficient and reliable quantity at reasonable cost, especially in some provinces of Eastern Canada, such as Quebec, where the almost feudal relationship between "habitant" and "seigneur" has a steadying effect among the advanced creeds which have proved at times so disturbing to industry in the new world.

The following figures, giving the wages paid in April, 1922, to factory workers engaged in the manufacture of woollen and knit goods will serve as a guide in determining the wages that would probably have to be paid many of the employees in an artificial silk mill in Canada.

Class of Workers	Approx. av. wage per 50 to 55 hour week Cents per hour
Wool Sorters	31
Finishers	26
Winders	23
Dye Room Employees	42
Knitters	24

*Abstracted from article prepared by the Natural Resources Intelligence Service, Department of the Interior, Ottawa, under the direction of Mr. F. C. C. Lynch, Director of the Service.

In the hosiery and knit industry in Canada there were 11,465 employees in 1920, 7,748 of whom were women; one per cent. of the total number of employees received a weekly wage of under $5 a week, 17 per cent. from $5 to $10, 40 per cent. from $10 to $15, 24 per cent. from $15 to $20, 14 per cent. from $20 to $30 and the remaining four per cent. over $30. Of the 127 plants in operation, from which returns were recieved in 1920, 90 were in Ontario and 22 in Quebec. The total value of the materials used was $31,701,536, to which artificial silk yarn contributed $220,000.

Another heavy item of cost in an artificial silk plant is the upkeep of the expensive capillary tubes, glass bobbins, and other such delicate mechanism.

As many important patents are involved in the various processes of manufacture, most of the more recently established artificial silk companies both in Europe and in the United States, have affiliated themselves to one or other of the important European concerns controlling the rights to these patents.

Tariff

The following rates of duty are now in force on artificial silk importations, having been included in the Canadian tariff along with other amendments recently passed by the Dominion Parliament.

Tariff Items		British Preferential Tariff	Intermediate Tariff	General Tariff
583a	Artificial silk yarns or filaments or artificial fibre silk yarns or filaments produced from a form of cellulose obtained by chemical processes, not more advanced than singles, not colored; artificial silk tops and waste or artificial fibre silk tops and waste produced from a form of cellulose obtained by chemical processes.....	10 p.c.	12½ p.c.	15 p.c.
583b	Artificial silk yarns, n.o.p., threads or twists or artificial fibre silk yarns, n.o.p., threads or twists, produced from a form of cellulose obtained by chemical processes, colored or not ..	17½ p.c.	22½ p.c.	25 p.c.
583c	Artificial silk fabrics or artificial fibre silk fabrics produced from a form of cellulose obtained by chemical processes or of which artificial silk or artificial fibre silk is the component part of chief value, n.o.p.....	17½ p.c.	27½ p.c.	30 p.c.
583d	Manufactures of artificial silk or of artificial fibre silk produced from a form of cellulose obtained by chemical processes or of which artificial silk or artificial fibre silk is the component part of chief value, n.o.p....	30 p.c.	35 p.c.	37½ p.c.

In some of the European countries, the present financial situation has built an effective tariff wall around the artificial silk industry, and other countries have found it necessary to impose a high rate of duty on all imports. France, for example, found it necessary to protect the industry by a duty of about 14 francs per pound and the United States by an import tax which in some cases is as high as 60 per cent. of the value of the artificial-silk fabric.

Prices

Unbleached viscose yarn, grade A, 150 denier, sold in New York in 1913 for $1.80 per pound and reached the peak price of $4.95 in May, 1920. Present prices are in the neighborhood of $2.75 per pound.

Prices of natural silk paralleled those of artificial silk but were inflated to a much higher degree. Raw silk, Shinshiu No. 1, which sold at $3.47 per pound in January, 1913, rose to $16.25 in January, 1920, and is at present selling at about $8.25 per pound.

Competition and Uses

Though the artificial silks are superior to the natural product in lustre, they are usually much inferior in strength and elasticity, especially when wet, and consequently have been largely restricted to the manufacture of those fabrics not likely to be exposed to much moisture. Real silk still commands the highest prices; the world's output has increased from 64,000,000 pounds in 1914 to 92,000,000 pounds in 1921; and during the year ending June 30th, 1922, the United States imported 48,179,000 pounds of raw silk valued at $300,000,000—highest on record.

It is only with the lower grades of natural silk that artificial silk offers serious competition. This is seen in the extent to which it is now used in the manufacture of braids and millinery and dress trimmings. An attempt is being made in England to develop cellulose acetate silk yarns, which are said to offer greater resistance to moisture than the viscose silks, for the binding of electric cords as a substitute for natural silk which is now used for that purpose. Artificial silk has also encroached to some extent upon the field of mercerized cotton in the making of dress linings.

Woven with real silk, wool, cotton and other fibres, artificial silk is used in the making of dress goods such as sweaters, jumpers, hosiery, underwear, cravats, shawls, satins, fancy silks and shirtings.

The same equipment and raw materials necessary for the making of artificial silk thread serve for the production of imitation horsehair for hats and upholstering, and of ribbon straw for the braiding and millinery trades. Artificial leather or cloth, films and ribbons or thin transparent sheets are also now manufactured in many factories. At the Munich Trade Exposition in 1922, imitation Smyrna rugs, silk sweaters and Gobelin tapestries, all made from a nitrocellulose silk, were exhibited.

In the United Kingdom, hosiery, knit goods, ties and braids consume about 50 per cent. of the total output, woven cloths between 10 and 20 per cent., yarns twisted with wool about five per cent., and elastic webbing between five and seven per cent.

Location for Plant

The logical location for an artificial silk plant in Canada would appear to be in either Ontario or Quebec, where most of the textile plants, including those using imported artificial silk thread, are situated. Such a plant would be favorably placed from the point of view of the domestic market, labor conditions, proximity to raw materials and rail and ocean transportation facilities.

Artificial Silk Industry Abroad

In January, 1923, according to a German authority, there were 25 artificial silk factories in Germany, 15 in France, 14 in the United States, 8 in Japan, 6 in Italy, 5 in Czecho-Slovakia, 4 in Belgium, 3 in England, 2 in Holland, 2 in Poland and one in each of the countries Switzerland, Sweden, Austria and Hungary. In spite of post-war disturbances the world's output of artificial silk has increased from 26,000,000 pounds in 1914, to 44,000,000 pounds in 1921. The average daily production in pounds during March, 1923 in some of the European countries was placed by some authorities at the following figures: France, 30,000; Germany, 35,000; Belgium, 25,000; Switzerland, 20,000; Italy, 20,000; Netherlands, Japan and Poland—each 2,000. Estimates of British production range from 15,000 pounds a day to 300,000 pounds a week. In the United States the production in 1911, when the first artificial silk plant was erected, was 320,000 pounds; to-day it is said to be in excess of 9,000,000 pounds a year.

GERMAN SPECIALTIES FEATURE MEDICAL EXHIBIT

One of the features of the commercial exhibits which were displayed in the Banquet Hall of the Mount Royal Hotel, Montreal, in conjunction with the Canadian Medical Week, was the noticeable presence of German drugs and specialties, including some specifics marked "original" and now returning in competition with similar articles manufactured elsewhere. An absolutely new remedy was "histoplast," which is just being marketed and has not yet reached the retail trade. It is the latest preparation of Professor August Von Wassermann, and is put forward as a cure for furunculosis, or, in every-day English, boils.

CHEMISTS' COMMITTEE OF ADVISORY RESEARCH COUNCIL REPORTS ACTIVITIES AND OPPORTUNITIES FOR RESEARCH

THE Committee of Chemists, associated with the Advisory Council for Scientific and Industrial Research, had its seventh annual meeting in Toronto, on the 28th May. The meeting was held in the Mining Building of the University of Toronto. Dr. R. F. Ruttan, of McGill University, was in the chair, and there were present eighteen out of the twenty members of the committee. Mr. J. F. Slee, Manager of the Coke Plant of the Steel Company of Canada, Hamilton, Ontario, was present by invitation.

The chairman gave a very complete review of the activities of the Research Council during the past year. He announced that Mr. Hume Cronyn, of London, had replaced Dr. R. A. Ross, of Montreal, and President H. M. Tory, of the University of Alberta, had replaced Mr. Lloyd Harris, of Brantford. Mr. Hume Cronyn has been very active, both in the House of Commons and throughout the country, in the intreests of research and the establishment of a Research Institute. Dr. Tory brings to the Council a high reputation, not only as an organizer and administrator, but also as an investigator in the field of physics.

The Research Council has one hundred and thirty-four members on its various associate committees, representing every portion of the Dominion and practically all fields of research, chemistry, physics, biology, mining, metallurgy, etc.

During the past year the Council expended $52,000 in assisting researches, both scientific and industrial. $36,000 was expended in the form of bursaries, studentships and fellowships, about forty young graduates were enabled by these scholarships to continue their studies and research after graduation.

The Council expended $3,500 in assisting the compilation and publication of a list of all the sets of scientific journals in Canada, giving the name of the library in which these sets are to be found, together with a statement as to whether they are complete from the beginning or have certain numbers wanting. This list will enable scientific investigators to know where they may obtain references bearing upon their work. Many of the larger libraries are prepared to supply photostats of articles required, or to lend the journal. This will be of enormous value to chemists and other investigators through the country. It will be issued in October next.

The chairman further announced that the Research Council was endeavoring to establish a quarterly journal in which would be published the research work carried out in Canada. With the exception of a small proportion which appears in the Proceedings of the Royal Society, nearly all the major papers are now published in England or the United States, and Canada does not receive credit for the volume of high class work which is now being carried on,

The Research Council has recommended strongly to the Department of Public Health at Ottawa the necessity of warning the public against the danger of carbon monoxide poisoning and it is hoped that a pamphlet will be published during the coming year.

Among the chemical researches of great industrial importance which have been carried out, the discovery of the cause of and a remedy for the black discoloration of canned lobster, by Professor Harrison of Macdonald College, is probably the most outstanding It is estimated that the lobster canners lose about $700,000 a year through this discoloration.

Attention was directed to the number of young graduates in Canadian universities who go to American graduate schools to continue their research work, and the hope was expressed that the universities in Canada would soon be in a position to train a larger number of graduates for the doctor's degree.

The main question discussed by the committee was the fuel question, considered from a chemical standpoint. This discussion which occupied several hours, was opened by the chair-

CHEMISTS' COMMITTEE OF RESEARCH COUNCIL IN SESSION AT TORONTO, MAY 28th, 1923
FRONT—Prof. Paul Cardineaux, Prof. T. Thorwaldson, A. Burton, Dr. A. E. McIntyre, Dr. R. F. Ruttan, R. Job, Dr. Boswell.
MIDDLE—F. J. Hambly, Prof. H. G. Bigelow, J. R. Donald, Dr. van der Linde, Dr. N. Macallum.
BACK—G. B. Eagleson, ————, Ross E. Gilmore, F. Slee, H. Freeman, Geo. H. Tomlinson.

man. He called upon Mr. J. F. Slee who gave a very clear and interesting statement of the economics of the utilization of bituminous coal. Dr. A. E. MacIntyre, of the Department of Mines, Ottawa, Mr. R. E. Gilmore, Dr. Neish, Mr. Horace Freeman and Dr. Shipley, of Winnipeg, took the most active part in the discussion. As a result of the debate it was clearly established, first, that it would not be economical to bring soft coal from the extreme east or west of the Dominion for coking purposes. Secondly, that the central portion of the Dominion, particularly in the large cities, could import American bituminous coal, convert it into coke and by-products economically; that the coke could be sold at a lower price than anthracite and that the by-products would pay for the coking. Thus the central part of Canada could be made quite independent of American anthracite as coke could be used in all stoves and furnaces designed for burning anthracite. Furthermore, it was brought out that a coking plant could not be economically worked in centres of population much less than one hundred thousand, as the market for gas would not be sufficiently large. Gas could be produced and delivered for distribution at less than forty cents per thousand. The full debate on this question will be found in the proceedings of the committee and may be obtained from the secretary of the Research Council.

Reports of progress in two chemical researches aided by the Research Council were then made, one by Mr. Horace Freeman on the use of sodium sulphide in connection with the smelting of complex sulphide ores in British Columbia. Mr. Freeman also announced a new method for the economic production of sodium sulphide. Dr. J. W. Shipley of the University of Manitoba, reported his recent findings in connection with the corrosion of iron and steel by alkaline soil and waters. He pointed out that clay is almost as corrosive as the alkaline soil.

Mr. R. E. Gilmore gave an account of the denatured alcohols used in Canada and discussed the question of methylation in eneral. The Associate Committee passed a strong resolution gn favor of a methylated spirit containing five per cent. of methyl ialcohol and asked the Research Council to urge upon the Department of Excise and Customs the importance of introducing this denatured alcohol as it entered into the preparation of one hundred and sixty eight different products, chiefly drugs, which could not now be manufactured in Canada in competition with the United States where this five per cent. alcohol is permitted.

Dr. van der Linde gave an excellent and suggestive paper on the utilization of waste wood which is now burned as refuse fuel.

Mr. Tomlinson gave a short account of the state of the industry based on the manufacture of ethyl alcohol from wood waste.

Mr. J. R. Donald gave an account of the milk-sugar and casein industry in Canada, pointing out the increased uses which have been found for both of these products and the consequent rise in their prices, also the possibilities of utilizing the large quantities of them which can be obtained as by-products in the cheese factories and creameries of Canada.

At the close of the meeting, the following six chemists were nominated to replace the six members of the committee who retire automatically this year: Dr. E. H. Archibald, University of British Columbia, Vancouver; Mr. A. G. Fleming, Canada Cement Company, Limited, Montreal; Mr. A. H. Heitman, Chemical Products, Limited, Trenton, Ontario; Dr. D. McIntosh, Dalhousie University, Halifax; Mr. W. H. Thom, Lyman Brothers and Company, Limited, Toronto; and Dr. G. S. Whitby, McGill University, Montreal.

TURPENTINE AND ROSIN IN MEXICO.

Considerable attention i being attracted by the development of the turpentine and rosin industry in Mexico. The scarcity of turpentine-containing woods and the increased costs of production in the United States have encouraged the opening of factories in Mexico, which is rich in turpentine-producing woods.

THE CANADIAN ASSOCIATION OF OFFICIAL ANALYSTS

THE latest organization of Canadian chemists was formed on June 6th at the close of the first conference of the Official Analysts appointed under The Feeding Stuffs and Fertilizers Acts. It will bear the self-explanatory name of The Canadian Association of Official Analysts, having the same function and the same duties to perform for the Dominion of Canada which the well-established and highly important Association of Official Agricultural Chemists has for the United States.

The conference was called at the instance of the Federal Department of Agriculture and was held in Ottawa, June 5th and 6th, the primary object being to discuss and decide upon methods of analysis which should be regarded as official in the examination and control of feeding stuffs and fertilizers throughout the Dominion. Later, no doubt, methods for the analysis of insecticides and fungicides and other related agricultural materials will be similarly established.

It may be stated by way of information and explanation that until recent years the Acts controlling the sale of feeding stuffs and fertilizers .were under the administration of The Inland Revenue Department. With the disappearance of this department a few years ago, this administration was shifted, together with the chemical staff (of which Dr. McGill was chief) to the newly-established Health Department of the Federal Service. Still more recently these Acts were transferred to the Department of Agriculture—where they rationally belong—and their administration placed with the Seed Branch, of which Mr. Geo. H. Clark is Commissioner.

The appointment in the more important centres of official analysts to conduct the necessary chemical and technical work in connection with the administration of the acts, rendered it highly desirable that this work should be uniform as to method throughout the Dominion and recognized as official. To this end and as the first step, Dr. Shutt, Dominion chemist, who for some time past has been engaged in investigational work in relation to "standards" connected with feeding stuffs, etc. and who has acted as a sort of scientific referee in questions in which matters of chemistry was involved, was asked to convene the conference and act as its chairman.

The chairman after welcoming the members explained the circumstances which had led to the calling of the conference, outlined the work which the conference would be called upon to consider and presented an agenda for their guidance. Mr. Geo. E. Grattan, M.A., chemist, of the Seed Branch, was appointed secretary of the conference. The following official analysts and chemists were present at the first meeting of Canadian Association of Official Analysts:—

Dr. Frank T. Shutt, Dominion chemist.
Dr. Paul Cardinaux, official analyst, Laval University, Quebec.
Dr. Adolph Lehmann, official analyst, University of Alberta, Edmonton.
Dr. A. T. Charron, official analyst, Dairy School, Ste. Hyacinthe, Que.
Prof. R. Harcourt, official analyst, O.A.C., Guelph.
Prof. Adam Cameron, official analyst, University of N.B., Fredericton.
Prof. L. Joselyn Rogers, official analyst, University of Toronto, Toronto.
Prof. L. C. Harlow, official analyst, Agricultural College, Truro, N.S.
Dr. A. C. Neish, official analyst, Queen's University, Kingston.
A. Lemoine, official analyst, Department of Health, Ottawa.
R. R. McGregor, official analyst, Department of Health, Ottawa.
G. E. Grattan, Seed Branch, Department of Agriculture, Ottawa.
C. H. Robinson, chemist, Department of Agriculture, Ottawa
L. E. Wright, chemist, Department of Agriculture, Ottawa.
Miss S. N. Hamilton, assistant chemist, Department of Agriculture, Ottawa.

H. S. Hammond, assistant chemist, Department of Agriculture, Ottawa.
C. J. Watson, junior chemist, Department of Agriculture, Ottawa.
G. R. Giles, junior chemist, Department of Agriculture, Ottawa.

A letter was read from Mr. H. M. Lancaster, recently appointed chief analyst of the Department of Health, Ottawa, expressing his regret at being unable to attend the conference (through absence from the city) and saying that he fully appreciated the objects and work of the conference and that he wished it all success.

The conference held four sessions, at which methods of analysis to be employed in the examination of feeding stuffs and fertilizers, were considered in detail and adopted as official. The members also discussed other matters, e.g., co-operative work on certain methods of analysis, fees for analyses and several related matters.

At the close of the conference it was unanimously decided to organize into an association so that there would be a permanent body, meeting annually to consider desirable changes in methods and which could engage in valuable co-operative work in perfecting methods. Dr. Frank T. Shutt was elected president and Mr. G. E. Grattan, secretary-treasurer of the new association.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS PLAN TRIP THROUGH ONTARIO AND QUEBEC

Plans have now been completed for the 128th meeting of the American Institute of Mining and Metallurgical Engineers, Inc., to be held in Ontario and Quebec, August 20th to 31st of this year.

The first day will be occupied with registration at the Parliament Buildings, Toronto, and entertainment by the Toronto mining men. The party will leave on a late train for Sudbury, where the following day will be spent visiting the Creighton Mine of the International Nickel Co., Limited, the Coniston Smelter of the Mond Nickel Co., Ltd., the Copper Cliff Smelter of the International Nickel Co., and the Murray Mine of the British American Corporation, at Nickleton.

On August 22nd and 23rd, the party will inspect the mines of the Coniagas Mining Corporation, Nipissing, and O'Brien Companies at Cobalt; the mines of the Keeley Company and Mining Corporation at South Lorrain, and the Wright Silver Mine, which is the oldest mine in Canada.

August 24th will be spent in the Kirkland Lake gold district, where the members will be taken to the following mines: Kirkland Lake, Teck-Hughes, Lake Shore, Wright-Hargreaves and Tough Oakes.

During the morning of the next day, there will be an inspection of the mill of the Abitibi Power and Paper Company, at Iroquois Falls (the largest pulp and paper mill in the world), following which the train will be taken to the Porcupine district, where several days will be spent visiting the mines and mills of the Dome Mines (South Porcupine); Hollinger Consolidated Gold Mines, Limited (Timmins); and the McIntyre-Porcupine Mines, (Schumacher).

The party will then leave for Quebec, via Cochrane, and, on August 28th, will tour Quebec City and environs, taking a midnight train to Thetford Mines, where the mines and dressing plant will be inspected.

During the morning and afternoon of August 30th, technical sessions will be held at the Mount Royal Hotel, Montreal, and, in the evening, there is to be a banquet at the hotel.

The last day of the meeting will be devoted to motor and boat trips around Montreal.

It is anticipated that about 200 members of the society will enjoy the excursion.

DEVELOPMENT OF ELECTROLYTIC IRON.*

THE electrolytic refining of iron might be termed an infant industry at the present time, but it should be remembered that the electrolytic refining of zinc was considered a very doubtful commercial possibility some few years ago, but was now an established process, with several millions of dollars capital invested. Electrolytic processes had also been established for the production of pure copper, nickel, lead, aluminum, gold, silver, etc.

The production of pure iron by electrolytic means has been a subject of scientific interest and research for over 70 years, but it was not until within the last ten or fifteen years, when the unusual physical and chemical properties of electrolytic iron had been realized that real interest was awakened in its production.

It has been found that pure iron is at least as soft and has better cold-working or drawing qualities than either pure aluminum or copper, and that after appropriate annealing and cold rolling or drawing, it is more than ordinarily durable in respect to exposure to atmosphere, corrosion, etc., and maintains a bright surface.

The experiments of Boettger, Beitz, Klein, Jacobi, Leick, Skrabel Maximowitsch, and other early investigators were outlined briefly, in their attempts to produce iron for magnetic and other investigations, and for facing of steel dies and electrotypes, where the hardness due to hydrogen, either occluded or combined with the iron, made it very suitable for this purpose.

The work of Burgess and Hambuechen in America, Cowper Coles in England, Fisher in Germany, and Boucher in France was outlined, and it was shown that as a result of the research work of these and other investigators, attention had been turned toward the commercial application of their accumulated knowledge to the manufacture of electrolytic iron, and processes were now in operation in several countries.

Manufacture of Tubes and Sheets by Electrolysis.

A process for the manufacture of pure iron tubes and sheets by electrolysis has been in operation at Grenoble, France, for the past eight years. The Societe Le Fer were pioneers in this establishment, and the process seems an undoubted commercial success, and can manufacture in competition with former established practice.

Dr. L. Guillet has described this process in the Journal of the Iron and Steel Institute for October, 1914.

The process consists mainly of the use of a revolving cathode in a neutral solution of ferrous salts kept neutral by circulation about the anode, or by steel turnings, using cast iron as anodes. Air is blown into the electrolyte to form an oxychloride of iron which is said to absorb the hydrogen that is liberted at the cathode. Current density is as high as 100 amperes per square foot, and temperature of electrolyte 75° C. The resulting iron, using ordinary pig iron as anode, averages 0.004 per cent. carbon, 0.007 per cent. silicon, 0.006 per cent. sulphur, and 0.008 per cent. phosphorus. Taken from the bath, the metal is hard, very brittle, and contains occluded or combined gases, notably hydrogen, which is readily driven off in a slight annealing. Tubes made by this process have better thermal conductiveness, are more resistant to corrosion, and are reported to have several times the strength of a fused metal tube.

In Germany, at the Langblein Pfannhauser Works, a ductile iron of high magnetic permeability and low hystersis is being made from an electrolyte of ferrous and

*Abstract of paper presented before Ottawa Section, Society of Chemical Industry, April 12th, 1923, by R. J. Traill, F.C.I.C., research chemist, Ore Dressing and Metallurgical Division, Mines Branch, Department of Mines, Ottawa.

calcium chlorides. In the United States at Hawthorn, Ill., the Western Electric Company have found electrolytic iron useful in making magnet cores. An electrolyte of ferrous sulphate and chloride and ammonium sulphate is used, with anodes of mild steel and polished sheet sheets as cathodes. The deposit is easily pulverized for compression into cores on account of its brittleness and hardness.

During the war many valuable machinery parts that had been made under gauge were saved from the scrap heap by the application of what is termed the building-up process, by which the under gauge parts were built up to proper dimensions by the electrodeposition of iron. Lieut. MacFadyen read a very interesting paper in this connection before the Faraday Society, to be found in the Transactions of the Society, Vol. 15. Hughes has also published much useful and interesting data on building up worn parts by electrolytic deposition, articles appearing in "Chemical and Metallurgical Engineering," Vol. 26, 1922, and "Electrician," Vol. 85, 1920.

The Eustis process, developed by F. A. Eustis and C. P. Perin, and the Estelle process, patented by Axel Estelle, were next described. These processes are applicable to the direct treatment of ores, particularly pyrrhotite and iron pyrite ores, and an important feature of the application is that they not only permit the recovery of iron, but also sulphur as a by-product, and where other metallic sulphides are present, such as copper, lead, zinc, gold and silver; these latter can also be readily recovered as by-products. The commercial application of these processes would assist in developing the natural resources of this country and at the same time put into profitable use resources which are to-day being discarded into waste and slag dumps of metallurgical works. Canada has abundant resources in pyrrhotites and iron pyrites, and many of these contain other valuable minerals, such as copper, lead, zinc, gold, silver, molybdenum, nickel, etc., which are not present in sufficient amounts to make the deposits workable for these metals alone, but if recovered as a by-product in the production of electrolytic iron may become profitable enterprises.

The author is investigating the possibilities of these processes and described some preliminary experiments with regard to leaching of pyrrhotite with ferric chloride as described in the Eustis process. Recoveries of iron and copper were obtained amounting to 90 per cent. and 75 per cent. respectively.

Pyrite is not so readily attacked by ferric chloride, and requires a preliminary treatment, which consists of the elimination or volatilization of one atom of sulphur, whereby an artificial pyrrhotite is formed. The ore is roasted in a neutral or reducing atmosphere. Tests were conducted on this method of treatment on a pyrite containing a small amount of copper and of lead. After roasting a leaching test showed recoveries of iron 85 per cent., lead practically 100 per cent., and copper 42 per cent.

The behaviour of other metallic sulphides were described in a test on the concentrate from a complex ore from British Columbia. The ore contained iron in the form of pyrite, and gold, silver, copper, lead, zinc, and arsenic. After roasting to convert the pyrite into a soluble form, leaching tests showed extractions of 98.5 per cent. iron, 85.2 per cent. copper, over 99 per cent. lead, 94.9 per cent. zinc, 81.6 per cent. silver, and the gold was left unattacked with the gangue. An attempt was made to recover these metals from solution by using steel turnings for precipitation, and in a single treatment a recovery of 84.9 per cent. lead, 85-7 per cent. copper, and 77.8 per cent. silver was obtained.

The results obtained and described by the author in his paper would show that the process has possibilities of becoming commercially applicable.

The laboratory of the Ore Dressing and Metallurgical Division of the Mines Branch, Department of Mines, is planning to make a more complete study of the process and its problems as pertaining to the utilization of Canadian pyrrhotite and pyrite ores.

COUNCIL OF CANADIAN INSTITUTE, SHOWING DATES OF RETIREMENT

For purposes of record and for the information of members, the following constitute the Council of the Canadian Institute of Chemistry at the present time:—

		Term Expires
British Columbia:	Horace Freeman, F.C.I.C....	May, 1924
Alberta:	Prof. A. Lehmann, F.C.I.C...	May, 1924
Saskatchewan:	Prof. T. Thorwaldson, F.C.I.C. (Vice-President).....	May, 1925
Manitoba:	Prof. J. W. Shipley, F.C.I.C.	May, 1926
Ontario:	Dr. A. C. Neish, F.C.I.C. (President).....	May, 1925
	L. E. Westman, F.C.I.C. (Secretary).....	May, 1924
	Prof. R. Harcourt, F.C.I.C.	May, 1926
	Dr. F. T. Shutt, F.C.I.C.....	May, 1926
	F. G. Wait, F.C.I.C.....	May, 1925
Quebec:	Prof. R. F. Ruttan, F.C.I.C.	May, 1924
	H. J. Roast, F.C.I.C.....	May, 1924
	Dr. A. T. Charron, F.C.I.C. (Vice-President).....	May, 1925
	H. W. Mathieson, F.C.I.C...	May, 1926
New Brunswick and Prince Edward Island:	Dr. J. Bates, F.C.I.C. (Past President).....	May, 1925
Nova Scotia:	C. E. Wallin, F.C.I.C. (Vice-President).....	May, 1926

In addition, Prof. J. W. Bain, F.C.I.C., Treasurer, is a member of Council, as a Past President. His term will expire upon the election of the next President.

SIX PH.D'S IN CHEMISTRY FROM McGILL UNIVERSITY

Six degrees of Ph.D. in chemistry were granted from the Graduate School of McGill, this year, as follows:

Louis J. Waldbauer, B. Chem., Cornell, 1917; M. Sc., McGill, 1922, Thesis on "Specific Heats and Latent Heats of Fusion at Low Temperatures."

Henry N. Stephens, B.A., MacMaster, 1920; M.A., University of Toronto, 1921; Thesis on "Oxidation of Caoutchouc."

James W. McKinney, B.Sc., University of Alberta, 1917; M.Sc. McGill, 1920; Thesis on "The Kerogen in Pyrobituminous Shale."

Jacob Dolid, Ph.B., Yale, 1919; M.Sc., McGill, 1921; Thesis on "Non-Caoutchouc Constituents of Rubber."

John F. Logan, B.A., Acadia University, 1913; A.M., Yale, 1916; Overseas Graduate School, 1919; Thesis on the "Chemistry of Bile."

Edward H. Boomer, B.Sc., University of British Columbia, 1920; M.Sc., McGill, 1921; Thesis on "Vapor Densities at Low Temperature over an Extensive Range of Temperature and Pressure."

CHEMICAL PLANTS WORKING AT PETROGRAD.

Since the beginning of this year nineteen chemical works in Petrograd have been worked by private enterprise. They were leased to their present holders by the Soviet Government, and now employ in all 484 workers.

CHARLES F. BARDORF, F.C.I.C.,

SECRETARY, MONTREAL SECTION, SOCIETY OF CHEMICAL INDUSTRY

Mr. Bardorf, the newly-elected secretary of the Montreal section, for the 1923–24 session, has won a high reputation as a sugar chemist. He has accomplished considerable research work of a very valuable character relating to the chemical problems of the sugar industry. As chief chemist and technical director of the St. Lawrance Sugar Refinery, Montreal, he has brought the operations of this large works under the latest methods of chemical control. It is putting it mildly to say that Mr. Bardorf is "well-liked" personally. His pleasant social qualities have made for him many lasting friendships among his fellow chemists.

DEATH OF A. M. LEBEAU

The sad death by drowning of A. M. Lebeau, a student member of the Canadian Institute of Chemistry is reported from Kingston. Mr. Lebeau was a student in Chemistry at Queen's University and since the closing of the spring term had been working in the laboratory of the International Nickel Company, at Port Colborne, Ontario. On Thursday evening, June 21st, he attempted to swim across the Welland Canal but the current proved too strong for him and he drifted into a waste water tunnel. A splendid attempt was made to rescue him but without success. The body was recovered the next morning and taken to Toronto where the funeral was held from the residence of his brother, Mr. Charles Lebeau, 441 Margaretta Street. Interment was made in Prospect Cemetery, six of his fellow students acting as bearers. "Art" was held in high esteem by all his fellow students and will be greatly missed by his class at Queen's next year.

FRANK W. HORNER

CHAIRMAN, MONTREAL SECTION, SOCIETY OF CHEMICAL INDUSTRY

For the 1923–24 term, the members of the Montreal section have chosen a manufacturing chemist, Mr. Frank W. Horner, as their chairman. Mr. Horner is president and general manager of the business which bears his name, established at 40 St. Urbain Street, Montreal. He is a Virginian by birth, but came to Canada in 1893, in his 18th year. Graduating from the Montreal Pharmacy College, he entered the pharmaceutical manufacturing business, first as assistant chemist for Davis Lawrance Co., Montreal, then as chemist for three years with Chas. E. Frosst & Co., followed by ten years with John Wyeth and Bros., as chemist and manager, after which he established his present very successful business, as a manufacturer of pharmaceuticals.

Mr. Horner is a governor of the Montreal General and Western Hospitals, and is a member of the Montreal Board of Trade, the Engineers' and the Canadian Clubs.

PERSONAL

Mr. E. W. R. Steacie, B.Sc., has joined the staff of Chas. A. Smart, Montreal, distributors of dyestuffs and textile chemicals. Mr. Steacie graduated this spring in chemical engineering from McGill University with honors and winning the British Association Medal. He is a nephew of General Smart.

Dr. J. A. Gunton has been appointed Professor of Chemistry at the Western University, London, Ont. He is a graduate of McMaster University, taking post-graduate work at the University of Illinois. Western University is extending its facilities in the Department of Chemistry, in line with program of active expansion now being carried out by the Insti tute as a whole.

RESEARCH WAS KEYNOTE AT LEATHER CHEMISTS CONVENTION

The twentieth annual convention of the American Leather Chemists' Association, held at the palatial Greenbrier, White Sulphur Springs, West Virginia, June 7th—9th, was enjoyed by a large and enthusiastic number of members and friends.

Research was the keynote of the meeting. Mr. Fraser M. Moffat, President of the Tanners Council, which recently appropriated $110,000 for the establishment of a Tanning Research Institute at the University of Cincinnati, gave an inspiring address on the problems and needs of the tanning industry, and pointed out the necessity of proving to the public the truth of the tanners' slogan, "Nothing takes the place of leather." He was followed by Dr. Harrison E. Howe, editor of the *Journal of Industrial and Engineering Chemistry* (American Chemical Society) who gave many instances where research had resulted in incalculable benefit to the public, besides returning large dividends to those who supported it, in some cases as a forlorn hope or without expectation of early returns.

Addresses were made by well-known colloid chemists. Prof. Martin H. Fischer of the University of Cincinnati spoke on "Some Scientific and Technical Aspects of Emulsion Chemistry"; Jerome Alexander spoke on "Degree of Dispersion as an Influence in Tanning." Prof. G. D. McLaughlin, Director of the Research Laboratory of the Tanners' Council, and his assistants, E. R. Theis and E. Rockwell presented papers giving the results of some of their research work on the "Science of Soaking and the Bacteriology of Curing Animal Skin."

An interesting contribution was a paper from the Procter Research Laboratory, Leeds, England, by J. R. Browne, F. C. Thompson and W. R. Atkin, on the "Ultrafiltration of Tannin Solutions with special reference to Tannin Analysis"; Prof. Allen Rogers, of Pratt Institute, Brooklyn, gave an interesting talk on leathers of marine origin, and exhibited a reel of films showing the capture of various kinds of sharks, porpoises and rays, which, considering the fact that tanners use also the skins of cattle, horse, alligator, snake, lizard, etc., shows that the tanner "has all nature skinned" in his effort to serve the public.

Committee reports on a wide variety of topics were presented by G. W. Schultz, R. W. Frey, Dr. Lloyd Balderston, Dr. Thomas Blackadder and Dr. H. C. Reed. The reports were the basis of a lively discussion by the members, as were also the following papers: "Determination of Free Sulphuric Acid in Vegetable Tanned Leather, by H. W. Frey, S. Kohn, T. J. Mosser"; "Elucidation of Details of Method for Determination of Free Sulphuric Acid in Vegetable Tanned Leather, by J. S. Rogers; "Extraction of Oils, Fats and Waxes from Leather" by Lloyd Balderston; "Effects of Sodium Chloride, Sodium Sulphate and Sodium Acetate on Precipitation Figure and Tanning Properties of a Chrome Liquor" by Donald Burton; "Further Observations on the Histology of Bated Skin," by C. S. Hollander; "Study of Some of Processes Involved in Tannin Analysis," by G. W. Schultz; "Direct Measurement of Plumping Power of Tan Liquor," by R. W. Hart.

WESTERN STUDENTS WIN SCHOLARSHIPS

Two of the three scholarships given by the Royal Commissioners of the Exhibition of 1851 have been awarded to students at Western Universities. Mr. Ivan Roy McHaffie, B.A., M.Sc., who, for the past two years, has been carrying on research work with Dr. J. W. Shipley, on the equilibrium of certain chemical reactions, in the Department of Chemistry of the University of Manitoba, has won a scholarship; and one has also been secured by Mr. Lehmann, of the University of Alberta, for his work under Dr. Boyle, on the conductivity of sound through water.

New Books Reviewed

"Sulphuric Acid and Sulphur Dioxide"

By Wilfrid Wyld. Gurney & Jackson, London. 558 pages. Price, 36s.

This is one of a series devoted to the detailed consideration of basic chemical industries. In fact, it is the direct successor to the first edition of Lunge's "Sulphuric Acid and Alkali." Everything written by the late Dr. Lunge was detailed. The authors now revising are following this excellent motto for book-writers who expect their labors to live.

The work is divided into five main chapters, dealing with historical notes, raw materials, properties and analytical procedure, sulphur dioxide production, by-products.

Full consideration has been given to recent advances in knowledge and practice and the experience gained during the very considerable expansion that has occurred since 1913..

Many of the modern changes refer to plant construction. Other fundamental advances have been made through the introduction of new processes and the disposal of by-products.

"Hydrochloric Acid and Saltcake"

By Alexander Cumming. Gurney & Jackson, London. 423 pages. Price 31/6

Like the sulphuric acid industry, the production of hydrochloric acid has seen some changes since 1913. This book covers these in detail and gathers up the scientific data available.

Attention is given in particular to methods displacing or likely to displace the Leblanc process, and the production of hydrochloric acid from chlorine. When compared with previous editions, the chapter on the Theory of the Absorption of Hydrochloric Acid will be found almost entirely rewritten.

The work is one of a series on the manufacture of acids and alkalis, being a continuation of the original works of Lunge.

"Motor Fuels—Their Production and Technology"

By Eugene H. Leslie. Chemical Catalog Co., New York. 680 pages. Price $7.00

The non-technical reader, the engineer and the chemist will all find something to interest them in this recent work. It is a very broad survey, yet complete in detail.

The book deals with fuels, and is confined within its general title, leaving uncovered many matters, such as storage and transportation, as well as considerable tabulated data on hydrocarbons, that may be had readily elsewhere.

The author throughout presumes that anyone seriously setting out to master the production and technology of motor fuels, must, of necessity, have a fundamental knowledge of the sciences bearing on the subject. In brief, chemical engineering, physics and thermodynamics occupy their proper place, and this method of treatment, along with an exhaustive survey of the development and present state of plant practice, makes a very considerable contribution to the subject.

As a reference work, the book will stand high, and in all departments is a really comprehensive treatise.

"Principles of Chemical Engineering"

By W. H. Walker, W. K. Lewis and W. A. McAdams. McGraw-Hill Book Co., New York. 635 pages. Price $5.00

Readers of this book will be impressed by the method of treatment of the subject matter. Fundamental principles are worked out in excellent detail, and the authors have shown their range in the subject by eliminating the catalogue review idea, which, to some extent, has been the source of information in many cases where less experienced individuals have attempted to write on certain phases of the subject.

The book then deals with principles and design, rather than with specific commercial equipment, and the business of building it into a plant. This does not mean that standard equipment

is not used to illustrate principles, as, in many chapters, well-known machinery, while not the basis of the discussion, becomes the practical illustration.

The authors have divided their treatment into five distinct parts, some extending through several chapters.

1. The principles of stoichiometry and the use of data.
2. Laws governing the flow of heat and fluids.
3. Fuels.
4. Mechanical methods of separating materials.
5. Processes depending upon vaporization.

Much of the material has been used as a text, at the Massachusetts Institute of Technology.

Without any hesitation, the book can be highly recommended to all chemical engineers, as something of more than usual merit.

"A Bibliography of Colloid Chemistry"
By Harry N. Holmes, National Research Council, Washington. Price $1.00

The National Research Council of the United States has recently issued a colloid bibliography in mimeographed form. The author, Dr. Harry N. Holmes, of Oberlin College, chairman of the National Research Council Committee on the Chemistry of Colloids, intends this edition to be preliminary to a more comprehensive one. Yet it is a book of 135 pages, containing 1,800 references on 106 topics. All the references are classified and many are accompanied by brief comment as an aid in deciding on their relative importance. This book may be purchased from the Washington office at $1.00. Among the classified groups are adsorption, asphalt, baking, biocolloids, capillary analysis, casein, cellulose and cellulose esters, cements, clays and soils, cleansing, coagulation, dialysis, emulsions, filtration, flotation, foam, flour, fogs, gels, gelatin, glass, glues, gold, gums, hydration, indicators, jellies, lubricants, milk, paints, rubber, sewage, silver, soap, sulfides, surface tensions, tanning, ultramiscroscope, viscosity and water proofing.

"Annual Reports, Society of Chemical Industry"
1922. Vol. VII. Finsbury Square, London, E.C. 2. 560 pages.

This has come to be a very valuable series of works. Each year, a number of leading chemists review progress in various chemical fields, and the 1922 Report shows, in a comprehensive way, what is new in chemistry.

It is a very practical book for the specialist, as each chapter is a distinct review of a special field. Plant and machinery is something in which everyone is interested, and the work is opened with a review in this line. A very important division of chemical industry is covered and always by an author who has special knowledge of the field. Compared with journal articles, such works are more interesting, and for anyone attempting to keep informed in many lines, exceedingly valuable.

"THE RECOVERY OF VOLATILE SOLVENTS."
By C. S. Robinson. Chemical Catalogue Co., New York. 190 pp. Price, $2.50 .

This seems to be a well-written little book for chemical engineers. The subject matter is one where practice at least has developed much modified or new equipment, even if theory has been fairly well established.

Solvent recovery work, as far as design of equipment and installation is concerned, is something that many engineers (both chemical and non-chemical) are required to know about from time to time. This work will allow them to grasp quickly both general and special methods, and place the results of a very exhaustive examination of the literature before them in brief form. The references are very complete, and the book is well planned.

Mining and Metallurgy in British Columbia

(Special Correspondence to Canadian Chemistry and Metallurgy.)

The Northwestern District

Preparation is being made for a very busy season in the northwestern part of British Columbia, and the district is likely to add to the laurels already won. Last year it produced 85 per cent. of the gold, 66 per cent. of the silver and 95 per cent. of the copper output of the province, and, though the percentage is hardly likely to be so high this year, as the competition will be keener, the actual metal output probably will be greater.

The Premier Gold Mining Company has started a new main-haulage tunnel at Thirteen-mile, close to the international boundary, which will give an additional 500 feet in depth and is expected to cut the main Premier vein at 2,400 feet from its portal. The company is providing for a large increase in its working force by building a 100-room boarding house and a six-suite apartment house for the married men of its staff. A tennis court and other forms of entertainment will be provided. It is rumored that the company purposes to erect a new and larger mill at the mouth of the new tunnel and to have it ready for time when the tunnel shall cut the main vein, and, though no official announcement has been made with regard to this improvement, there would seem to be good foundation for the rumor, as the existing mill is being operated at considerably above the capacity it was designed to treat and practically all the ore below the present bottom level is likely to be of milling grade.

B. W. W. McDougall will supervise the development of Forty-nine and Bush groups, on the Canadian side, and the Daly-Alaska group, on the Alaskan side, for the London interests headed by H. S. Denny. Development has been started on the Bush and the Daly-Alaska groups, and will be commenced on the Forty-nine as soon as the snow is off the ground. The last group is situated at a high elevation at the head of the Salmon River Valley, and, consequently, the season opens later.

R. R. Wilson is supervising the development of the Big Missouri, Unicorn, International, and Stoner groups for the Trites-Wilson-Wood syndicate, which brought the Premier mine to the producing stage.

Stewart Gold Mines, composed mainly of Vancouver and Victoria interests, has bonded some 60 claims to the east of the Premier mine and running over Bear River Valley ridge into Bear River Valley. It is stated that not less than $100,000 will be spent in development during this season.

Indian and Mobile companies, the stock of which is held principally in Montreal and Toronto, have been operating steadily through last winter, and both properties are likely to be in a position to ship ore during the coming winter. Should the development warrant it a mill will be erected at the Indian mine this summer.

There is much activity on McGarth Mountain, in the Alice Arm district, and some promising properties are being developed. The Kitsault River district is being held back by the non-operation of the Dolly Varden railway. As yet, there seems to be little prospect of the railway being re-opened this year. The Taylor Mining Company fairly effectively scooped all the ore in sight from the Dolly Varden mine, without doing any development, consequently it is difficult to interest capital in the property. There are a group of promising properties—the Esperanza, the Alice and the Lone Maid,—within a few miles of Alice Arm and convenient to shipping that should be heard from this year.

Concentration Superseding Semi-Pyritic Smelting

The Granby Company's Mines may be trusted to give a good account of themselves. A large sum of money has been spent on the power plant, and this improvement will become effective this summer, completely eliminating the use of coal for power purposes, and thus markedly decreasing production

cost. The new 1,500-ton concentrator has been started, and, it is expected, will be in operation early in 1924. It looks very much as though this were the thin end of the wedge, which when driven home will mean the abandonment of semi-pyritic smelting that has been carried on so successfully in this province. The high price of coal has taken the profits away from the enterprise since the war, and it will not be surprising if concentration entirely supersedes this once-profitable metallurgical operation.

On Princess Royal Island Belmont-Surf Inlet Mines has materially cut operating costs and should have a profitable year. Last year it produced 35,000 ounces of gold, 17,000 ounces of silver, and 700,000 pounds of copper, but a considerable inroad was made into the ore-reserve.

Smithers-Telkwa District

Great activity is being shown in the district contiguous to the Grand Trunk Pacific railway, in the vicinity of Smithers and Telkwa, and the present season's developments should give some definite results as to the value of the district.

The Federal Mining & Smelting Company has shipped in a compressor and a lot of machinery and supplies to the Jefferson consolidation that it has under option, on Dome Mountain. This is essentially a gold proposition, though some of the veins carry silver in important quantities. There also is a considerable proportion of arsenopyrite in some of the ore, and if the depredations of the boll-weevil continue in the cotton crops of the Southern States the arsenic content will be important.

The Kootenay District

The Silversmith Mines continues its splendid record of production in the Slocan, some 4,500 tons of concentrates having been shipped since the beginning of the year, the production being about half zinc and half lead concentrate. The Ruth-Hope mine, which is operating on the same vein, has made several shipments of high-grade ore. Recently a parallel vein was struck in a cross-cut from the main vein, and it is possible that this discovery may add materially to the ore-reserve of both the Ruth-Hope and Silversmith mines. Lessees at the old Standard mine have shipped 800 tons of concentrates —mostly zinc—since the beginning of the year. This, however, is rather in the nature of a dirge, as the concentrates were derived from pillars, which had been left to support the workings. Unless some new ore is found soon, this famous mine, which has paid its owners $2,700,000 in dividends, will soon be closed permanently.

A new body of ore was struck recently in the bottom workings of the Queen Bess mine. The mill at the Cork Province has been restarted, after a long period of idleness. The property had been in the hands of lessees for some time, but last year was taken over by its owner, Cork Province Mines, Limited, and a considerable body of ore has been developed. The Bosun, Van Roi, Whitewater and Wonderful are all producing well, and a number of other mines are producing in a smaller way.

New Sullivan Mill Turning Out Over 1,000 Tons Daily

In the East Kootenay the new Sullivan mill is rapidly nearing completion. At the present time the mine is turning out more than 1,000 tons of ore daily, and this output will be doubled as soon as the new mill is put into operation. The Paradise mine continues to develop well, but like the other mines in that district it is handicapped by the unsatisfactory state of the roads over which the ore has to be moved. The St. Eugene, at Moyie, has been re-opened, after a long period of idleness. There is every indication that the present will be a very prosperous year in the Kootenays.

World Wide Chemical News

(Special Correspondence to Canadian Chemistry and Metallurgy from Our London Representative)

GERMAN FOREIGN TRADE IN CHEMICALS

First Quarter, 1923

From figures just published, the foreign trade in chemicals during the first quarter of 1923 has decreased as compared with the same period and average monthly totals of 1922.

Among the principal commodities the following changes have taken place:—

IMPORTS IN DOUBLE CENTALS

	Aver. Month 1922	Jan.–March 1923
Dyes and Dyestuffs	6,860	24,250
Potash and Products	80	...
Soda and Products	57,720	149,590
Chemical and pharmaceutical products	133,230	405,160
Tanning Materials	21,300	34,830

EXPORTS IN DOUBLE CENTALS

	Aver. Month 1922	Jan–March 1923
Dyes and Dyestuffs	124,880	364,380
Potash and Products	204,890	342,570
Soda and Products	2,260	2,780
Chemical and pharmaceutical products	433,400	1,276,960
Tanning materials	5,320	31,290

From the above figures it will be seen that, whilst imports are all below the average monthly figure of 1922, exports show a decrease in the first three items, and an increase in tanning materials, but no change in chemical and pharmaceutical products.

Acetic Acid Production in Germany

Official figures just published in regard to the production of acetic acid in Germany during the fiscal year 1921–22 indicate that there were 19 plants in operation of which twelve produced excisable material. Whilst in 1913 only 26,818 double centals were passed by the authorities for human consumption purposes and 959 d.c. for industrial purposes, the figures for 1921 are given as 51,811 and 10,960 d.c. respectively. This increase is explained as being a result of the shortage of other materials used before the war.

Italian Metallurgical Industry Improved

During 1922 the metallurgical production in Italy showed a notable improvement as compared with 1920 and 1921, while, however, remaining below that of 1913.

Exports of Swiss Dyes .

In 1922 the exports of aniline dyes from Switzerland totalled 3,872,800 kg., with a value of 55,257,000 francs, thus exhibiting very little change as compared with the previous year. On the other hand the exportation of artificial indigo made good progress and totalled 3,460,800 kg., with a value of 13,158,000 francs as against 1,182,900 kg., with a value of 9,497,000 francs in 1921.

New Process for Tannin Esters

In the "Schweizer Chemiker Zeitung," a process is described of making tannin esters from waste sulphite cellulose liquors, recovered in paper mills. The waste liquors are treated with toluene sulpho-chloride, which is a by-product recovered in the manufacture of saccharin. The lignin sulphonic acid, which is contained in the sulphite cellulose liquors, possesses only a slight tanning effect. Through the influence of toluene sulpho-chloride in the form of an ester of toluene sulphonic acid, a solution of tannin is formed, "ester-tannin." When the acid percentage in this solution is correct, the solution possesses tanning properties which can be utilized to good advantage. The process is carried out by allowing the sulpho-chloride to act on an alkaline solution of the sulphite cellulose liquor. When this "ester-tannin" is used in the proper manner, it produces a good leather of somewhat lighter color than that which is obtained with the ordinary natural tannins. It is quite advantageous to use this synthetic tanning material in combination with the natural tannins.

Swiss Carbide Works Closed Down

Swiss carbide plants having a yearly capacity of close t

120,000 tons are being closed down. Since only about 10,000 tons is used annually within the country, the present export crisis is affecting the industry vitally. The cement industry is likewise hard hit due to the present high price of coal and to its dependence on export markets.

Russia's Naphtha Export Trade

According to official figures published in the "Ost-Express," the Russian export of naphtha products in 1922 amounted to 11,455,000 puds, including 4,815,000 puds of petroleum, 2,875,000 puds of benzine, 3,099,000 puds of lubricating oil and 588,000 puds of fuel naphtha. An amount equal to 55.7% went to England, 23.8% to Germany, 8% to Persia, 6% to France, 4% to Turkey, 2% to Hungary and the remaining 0.5% was divided between Belgium and Latvia. The naphtha export trade is being reorganized and will be effected exclusively through the medium of the State Naphtha Syndicate, with headquarters in Berlin and Constantinople.

Polish Starch Industry

The starch industry in Poland takes second place in the world's starch production, Holland being first.

As there is a large quantity of potatoes available, the starch industry in Poland is developing very favorably, especially in Posnania.

Besides starch, the potato industry produces also dextrine and syrup.

The chief markets for those products are Great Britain, Switzerland, Spain, Portugal and Southern America.

Owing to a very successful potato crop, the output of potato by-products in 1922-23 has nearly reached the pre-war level.

Japanese Fertilizer Factory

The Suzuki Shoten are to establish a factory for the manufacture of sulphate of ammonia on the island of Hikojima, near Moji.

The capital of the new company is understood to be 10,000,000 yen, one fourth paid in. The machinery for the plant has been ordered from abroad and has already been shipped.

Russian Chemical Trade

The possibility of a break in the Anglo-Russian trade relations recalls the fact that prior to the war, Russia purchased in foreign countries more than £2,000,000 worth of chemicals and drugs yearly, in addition to half a million worth of dyes, £200,000 worth of indigo and £600,000 worth of vegetable oils. About 60% of these purchases came from or through Germany.

The war compelled Russia to develop her own chemical industry, and certain progress in this direction was being made until it was arrested by the revolution. With the introduction of the new economic policy these efforts were renewed and several chemical trusts, which are now operating are said to be quite successful.

Among the 400 odd applications made this year, by foreign concerns for concessions in Russia, the chemical industry represents 26%. Of the concerns which made these applications 299 are German, 56 are Americans, 55 are British and 50 are French.

So far, however, only 26 applications have been accepted and agreements entered into.

Protection Asked for Tasmania Carbide

The question of the protection of the Southern Tasmanian carbide industry is again under discussion. Last year the commonwealth Government placed an embargo on the importation of carbide on the understanding that the works of the Electrona Company would be enlarged sufficiently to enable Australia to supply its own needs and become independent of importations. The company set about the duplication of plant, but in the meantime was unable to manufacture sufficient carbide to meet the existing demand. The embargo was removed therefore as from December 1st last, with the result that a flood of foreign carbide imports took place, prices being quoted much below what the locally-produced product can be sold for at a profit. The company has therefore appealed to the Government to restore the embargo, and their request is being considered by the Tariff Board.

Synthetic Ammonia Plant for Spain

The French inventor, M. Georges Claude, is installing at Flix (Tarragona) for a Spanish syndicate, a synthetic ammonia factory for the manufacture of this product by the Claude system, on the basis of 3,000 to 4,000 cubic metres daily of hydrogen produced by the Electroquimica de Flix Company in the electrolytic manufacture of soda. This initial amount is very modest, but the initiation in Spain of this new industry is being watched with considerable interest.

Japanese Imports of Dyestuffs

The total imports of dyestuffs into Japan last year were about 42,400 tons, valued at nearly $6,500,000. Germany's share being over 88% of the trade, with United States second (8½%), Switzerland third with 1.65%, France fourth with .785% and Great Britain fifth with .423%.

Moroccan Phosphate

The production of phosphate in Morocco in 1922 was 80,583 tons. It is estimated that 300,000 tons will be exported in 1923 and that by 1927 a production of 1,100,000 tons will have been attained.

Amalgamation of Oxygen Companies

The Soc. Centrale l'Air Liquide proposes to amalgamate with the Soc. de l'Azote. The modus operandi as reported is a payment of an additional 50 fr. per share of the Centrale company and the exchange of five of these shares for one of Azote company. The latter is to take place after the amalgamation of the subsidiary companies has been accomplished. The latter are Oxygene et Acetylene du Japon, Acetylene Dissons, et. Soc. Egyptiene de Gaz Comprimes.

"Natalite" in South Africa

The South African railways have contracted with the Natal By-Products, Limited, for a six-months' supply of the sugar-cane distillate fuel "Natalite," to be used in the motor transport service.

A considerable amount of attention is being attracted to the experiments now being made with the object of utilizing as raw material for industrial alcohol the immense quantities of Opuntia (prickly pear) infesting an area stated to be not less than 2,000,000 acres in the Union of South Africa.

United States Sends Special Agent to Germany

The appointment by the United States Government of Major Breithut to a new position created in the interests of the American chemical industry is an interesting departure.

Major Breithut's duties, insofar as they are understood in advance of his taking them over, are to keep a careful check and watch upon the operations and development of the German chemical industry and to transmit such reports to the Department of Commerce as he may deem of sufficient interest or importance.

British Phosphate Industry Depressed

The British superphosphate industry is still experiencing serious difficulties owing to the severe depression in agriculture. As time goes on the situation appears to be aggravated rather than relieved, as continental competition is active for the limited amount of business which is passing. The outlook for the immediate future is not encouraging, though most of the plants are still being carried on in the vague hope of better conditions.

Synthetic Apple Oil

Synthetic apple oil, prepared by Dr. F. Power and his associate Mr. V. K. Chestnut, of the U.S. Bureau of Chemistry, for which a public service patent was granted in 1922, is now being manufactured by a commercial concern in New York.

This apple oil possesses the aroma of ripe apples and is the result of a prolonged chemical investigation of their odorous constituents.

Industry and Trade

Industrial Developments---Trade and Company News---Financial Notes---Patents Market Review and Prices

INDUSTRIAL DEVELOPMENTS.

Halifax, N.S.—The gold mine formerly operated near Carleton, Yarmouth Co., is being inspected, and samples of gold and lead analyzed.

Sault Ste. Marie, Ont.—The plants of the Algoma Steel Corporation here are working to capacity—double shifts of ten hours each—on the manufacture of rails and pig iron for Canadian railroads.

A syndicate, composed of Messrs. W. J. Madigon, D. H. Hooey, and A. Harrison, have started operations near Kaufman Spur, Shawanaga, opening up a feldspar mine. They report feldspar in large quantities of high quality.

Edmonton, Alta.—The McMurray Asphalt & Oils, Ltd., are making good progress with their plant at Waterways, according to reports received here. A carload of machinery was sent in early in the spring, and other shipments of machinery are on the way. A railway siding is being built to the works. For the present, this company will concentrate its efforts on the crude products of the bitumen in commercial quantities for street paving and roadmaking purposes.

Fredericton, N.B.—The University of New Brunswick will erect a Memorial Hall here.

A new agricultural school is to be built at the Dominion Experimental Station.

Winnipeg, Man.—The total number of flour mills now operating in Canada is 1,333, with a total daily capacity of 110,000 barrels of flour. Canada has the largest flour mill in the British Empire, with a daily capacity of 14,000 barrels.

Port Arthur, Ont.—The new mill of the Provincial Paper Mills, Ltd., at Port Arthur, Ont., is now running at capacity, and is producing about 30 tons daily.

Lethbridge, Alta.—It is reported that efforts are being made to interest American capital in a sugar factory, to be established in Southern Alberta, probably at Raymond. A sugar company at Salt Lake City is said to be behind the project, and will build a factory if results of tests with beets this year are satisfactory.

Selkirk, Man.—The Canadian Insulation Co. has completed a new unit and installed machinery for the manufacture of a flax fibre for furniture upholstering. It will be run in conjunction with their present plant, in which they make Sealofelt building insulation.

St. Catharines, Ont.—A new paper mill, representing an initial outlay of $400,000, is to be established on the town line between this city and Merritton. Mr. L. H. Gardiner, President of the Garden City Paper Mills, will be president of the new concern, which will operate under the same name.

Winnipeg—A mill is to be erected at Fort Alexander, on the Winnipeg River, by the Manitoba Pulp & Paper Co., an organization now being capitalized.

Edmonton, Alta.—The recent incorporation of the Potato Products, Ltd., is of interest as it marks the introduction of a new industry, which may have a beneficial effect on the potato-growing industry of Alberta. This new company will manufacture flour, starch, dextrine, alcohol, etc., and will utilize a large proportion of the average surplus of 250,000 bushels of potatoes in the Edmonton district.

Quebec, P.Q.—The Board of Trade and the Quebec Harbor Commission are planning the construction of a cold storage plant, at an estimated cost of $500,000.

Sarnia, Ont.—A grain elevator, with a capacity of 1,500,000 bushels, is to be erected here by Canadian milling interests. Plans also call for the construction of a ship basin at the north end of Sarnia Bay, to accommodate large steamers. The elevator will cost about $2,000,000 and the ship basin $2,000,000.

Cobalt, Ont.—It is understood that contracts have been let to proceed with the development of a first unit of twenty thousand hydro electric horsepower at Des Quinze. It has been decided to develop 25-cycle energy to conform with the plants of the Northern Canada Power Co., in the Porcupine district, and that, if energy from this source is required for Cobalt, South Lorrain or Kirkland Lake, a regenerating plant may be installed, to conform to the fifty cycle energy in those fields.

Halifax, N.S.—The National Fish Co. is likely to supply the fish for the making of Insulin in the immediate future. The only fish that can be utilized in the manufacture of Insulin are the monk and the skate, of which there are large quantities in Atlantic waters.

Sydney, N.S.—Ore shipments from Wabana, Nfld., to Germany, which were temporarily halted by the invasion of the Ruhr, have been resumed. The steamship Strass, which recently arrived here, has sailed to Wabana, to load the first cargo of Newfoundland iron to be taken to Germany this season.

Montreal, P.Q.—The United States has invested in Canada $2,500,000,000, according to the Bankers' Trust Co. of New York, which has just completed a survey of Canadian industry and the amount of U.S. capita invested. Of the total sum invested, $1,200,000,000 is in bonds, the remainder in farms, mortgages, small businesses, industrial enterprises, banking and private loans. More than 200 branch factories were opened in Canada by U.S. concerns in 1919, and a great number in 1920 and 1921. Late in 1922, the number of these came to 700.

Ottawa, Ont.—During the past twelve years the mines of Canada have yielded an appraised wealth in excess of two billion dollars. The estimated value of securities connected with Canada's mining enterprises is $774,749,000, half of the stock being owned in Canada. Those investing in Canadian mining development have been paid $210,000,000 in dividends in the last twelve years.

Ottawa, Ont.—The export of silver bullion from Canada, for the year ended April, 1923, totalled 11,220,130 ounces, valued at $7,586,039, as compared with 10,431,214 ounces, valued at $6,737,319, in the twelve months ended April, 1922. Silver contained in ore and silver concentrates exported during the same period, amounted to 5,893.466 ounces, valued at $3,891,957, compared with 3,424,620 ounces, value $2,175,905, in the preceding year.

Nelson, B.C.—The granting of a bounty on copper rods, etc., has caused considerable elation in the Nelson, Kootenay district. The Secretary of the Associated Boards of Trade, Mr. F. A. Starkey, in speaking on the subject, states: "We fought very strongly for this, and placed before the Finance Minister and the Premier, the advisability of having such protection, against the importation of scrap copper, brass, zinc, etc., used in manufacturing articles placed on the market to compete against articles made of virgin copper made in Canada. It means much to this province. Trail refining and manufacturing of copper rods alone will now call for at least 500 extra men, and, when the copper mines are running full-manned, we may expect to see not less than 1,500 men required, which means that British Columbia will be giving employment in the copper industry alone to 2,000 more men, and making it possible for the different properties mining on a large scale, such as Copper Mountain, Princeton, Granby, Anyox, Sunlock, Victoria, Howe Sound, etc., to produce annually 200,000,000 pounds of copper.

Pembroke, Ont.—The Edwards Lumber & Pulp Co., Ltd., have purchased the mills and limits of the Colonial Lumber Co., Ltd., at Pembroke, Ont. The Colonial Company has been operating for twenty years, and at present has an annual output of about 25,000,000 ft. It is planned to double the capacity of the mill, and later build a pulp and paper mill.

Montreal, P.Q.—The Franco-American Chemical Co., Ltd., which, just prior to the outbreak of war, had established a plant and headquarters in Belgium, and were in successful operation there, lost the fruits of fourteen years' work and $60,000 in cash, when the Germans overran the country. They are now asking for an indemnity of $187,000, in a claim recently submitted to Hon. Dr. Pugsley, head of the Reparations Commission, here.

Lethbridge, Alta.—Faith in the ultimate discovery of a commercial oil flow in Southern Alberta is further indicated in the selection of a site here for an oil refinery which is to be established to handle Montana crude oil until there are Southern Alberta producing wells.

Regina, Sask.—The Saskatchewan Co-operative Creameries, Ltd., the biggest dairying organization in the province, has just completed arrangements whereby all of its exportable butter output during the summer months will be shipped to Great Britain. This will involve shipping between two and three million pounds of butter.

Winnipeg, Man.—"Should there be no serious impairment between now and harvest, the West looks like astonishing the world with a 500,000,000 bushel crop," declared R. C. Craig, president of the Winnipeg Grain Exchange, who returned to the city after a three weeks' motor trip through central and northern Saskatchewan and Alberta. He reports crop conditions excellent everywhere.

Cornwall, Ont.—The Howard Smith Paper Co. here have asked for tenders for a large addition to their plant, to involve an expenditure of several hundred thousand dollars.

Ford, Ont.—For the fifth consecutive month of this year, the Ford Motor Co. of Canada, Ltd., has broken its previous monthly records, and the output during the month of May was the highest in the history of the company. During May, the Ford Motor Car Co. sold 417 cars daily, a total of 10,000 cars.

Calgary, Alta.—The Western Canada Flour Mills Co. will construct a 150,000 bushel storage extension at their plant here, costing approximately $40.000. The work will consist of the erection of concrete tanks and heating tunnels.

The Essex district of Ontario exported to Great Britain last year over one million pounds of tobacco, for use in making cigarettes, pipe tobacco and twists. It is looked upon very favorably by British importers, because of its superior flavor.

ALKALI INDUSTRY CENTENARY.

The year 1923 marks the centenary of one of the chief of Britain's industries—the Heavy Chemical Industry. It was in 1823 that James Muspratt, in Liverpool, laid the foundations of what must be regarded as a romance of modern industrial progress.

Born in 1793, of a family which had long played a not unimportant part in various branches of business, James Muspratt was early apprenticed to one of the pioneers of fine chemical manufacture. He volunteered for service with the British army in Spain in the campaign against Napoleon, and after many adventures both with the army and as a midshipman for a short time in the navy, he returned to Dublin where his parents had lived, received the small patrimony that had been left to him, and set up in the business of manufacturing prussiate. In 1822 he decided to strike out on bigger lines, and moved to Liverpool, where he began manufacturing sulphuric acid.

The country was at that time suffering, as it is to-day, from the effects of a devastating European war. An opportunity came to James Muspratt; he realized its importance and seized it, and we see the result at the present time in the immense undertaking of the United Alkali Company, Limited, an organization whose fame and interests are world-wide.

It was within a year of the establishment of the sulphuric acid works in the Vauxhall Road, Liverpool, that the Salt Tax was removed. Muspratt immediately established a plant to work the Le Blanc process which had been invented by Nicolas Le Blanc, the French scientist, who had died a victim of the revolutionary chaos in his own country before he could benefit by his discovery.

The new venture at Liverpool was an undoubted success from the beginning. It brought a fortune to its enterprising founder and added an asset to the country's industrial resources, which was destined to render incalculable service when the war with Germany came, with its imperative demand to meet the "chemical" activities of the enemy.

The Le Blanc process was superseded during the war in favor of other methods which constant investigation and research have proved more suited to modern requirements.

It must not be thought that the success of James Muspratt was allowed to go unchallenged. Many competitors set up in the business of manufacture of alkali by the Le Blanc process, and the industry continued to flourish throughout the first half of the nineteenth century. The American Civil War brought a check but the trade quickly recovered until, in the seventies, over-production began to diminish profits. Then, in 1881, the ammonia soda process was established on an important scale by Messrs. Brunner Mond & Co. Ltd., at Northwich, and the pressure upon the old method became more severe.

Negotiations for amalgamation proceeded for some time, and in 1890 the United Alkali Company, Ltd., came into being, controlling at its inception forty-eight works, of which forty-five were chemical and three salt works. The company, moreover, controlled the Le Blanc departments of five other works and had working agreements with other concerns manufacturing similar chemicals. Sir Charles Tennant, Bt., was Honorary President of the Company till his death in 1900. The first chairman was Mr. John Brock, formerly of the firm of Messrs. Sullivan & Co., Ltd., of Widnes. On his retirement in 1913 he was succeeded by Sir Max Muspratt, Bt., whose father, Dr. E. K. Muspratt, son of the founder of the industry, was one of the original directors and is now honorary president of the company.

It is a matter of interest that of the great names associated with the Alkali Industry in its early days, there are still a number of direct representatives concerned in the control of the Alkali Company. There are on the Board to-day two Muspratts, grandsons of the founder, a Gaskell and a Tennant; while Mr. Henry Wade Deacon is one of the trustees for the debenture holders.

In celebration of the centenary, the United Alkali Company, Ltd., has issued an attractive brochure, from which the above facts are taken, giving a brief account of the rise and progress of the industry, and outlining the steps which led up to the establishment of the company. The Tyne Alkali Industry is described and an account is included of the Tennant family to which it owes its origin.

In offering its congratulations and good wishes to this great industrial organization on the completion of its first hundred years of activity and progress, the Federation of British Industries is moved by the further pleasant consideration that, prominent among the small band of industrial leaders to whose vision and enthusiasm is due the existence of the F.B.I., was Sir Max Muspratt, now one of our Vice-Presidents, and an active member of many important committees.—From "The Federation of British Industries Bulletin."

EQUIPMENT ASSOCIATION MEMBERS FAVOR BIENNIAL EXPOSITION.

Members of the Chemical Equipment Association are overwhelmingly in favor of holding the National Exposition of Chemical Industries every other year rather than yearly, according to the results of a questionnaire.

Inasmuch as its membership makes up a very large exhibiting group and is naturally interested in all promotional and educational endeavors connected with the chemical and allied industries, the Association, as have other trade associations and professional societies catering to or representing the chemical industry, has been constructively interesting itself for some time in the Chemical Exposition. Its interest in the welfare of the Exposition was recently recognized to the extent of the addition of several of its members to the Advisory Committee of the Chemical Exposition.

For the guidance of the six individual members of the Association who are members of the Advisory Committee of the Chemical Exposition, the Association recently authorized a questionnaire among its active members on various matters, both affecting fundamental exposition policy and incidental matters of management, arrangement and minor conduct.

A statement issued by the Association from its offices at 1328 Broadway, New York, states: "The response of our active membership overwhelmingly declared the advisability of a biennial rather than an annual exposition. Numerous comments accompanied the expressions of this belief. These comments indicate that there is not necessarily any belief among the large equipment exhibitors that biennial expositions must essentially forever be preferred, but that at present, considering industrial conditions in general, the status of the chemical and allied fields, of the rate of developments within them, and the results of past expositions, biennial expositions can adequately serve the field and be of greater benefit to it than annual expositions."

The Maple Leaf Milling Co. has acquired another mill in the West. When this is in operation the daily capacity of the various mills of this company will amount to nearly 30,000 bbls.

RUHR OCCUPATION AIDS AMERICAN CHEMICAL PROSPERITY.

That the occupation of the Ruhr District by the French is having a direct bearing on the increased prosperity of the American Chemical Industry, is without question a fact. The inability of German chemical plants, not only in the occupied area, but all over Germany, to secure domestic coal, and the high prices ruling for English coal, have combined during the past six months to cut down production and retard the shipment of chemicals for export. Then again, the difficulties which German chemical manufacturers have had to surmount in order to keep their plants running at all, have been great.

Particularly the heavy buying in the United States during the first four months of this year, and the rise in prices for imported chemicals, gave the American chemical industry an impetus which it has not felt since 1919. Higher prices for foreign goods encouraged American production and was the cause of the resumption of manufacure of many products discontinued by American makers since the 1920-21 slump. At the National Exposition of Chemical Industries, which will be held this year at the Grand Central Palace, New York, during the week of September 17th to 22nd, a number of new products from American plants, production of which was started as a direct result of the reduced competition from abroad, due to the Ruhr occupation and the new Fordney-McCumber tariff rates, will be shown.

The greater number of American chemicals and the fewer foreign items being used in the United States, as compared with conditions a year ago, will undoubtedly be reflected in the Chemical Exposition.

Early estimates indicate that in the line of "Made in America" chemicals which will be shown this year will cover a broader field than even during the most active period of the war. Of course, equipment developments in America during the year have not been affected to such a degree as the chemicals by changed conditions in Europe, although the strides forward, which will be exhibited in September, have been large.

During June, the demand for chemicals in the United States has been smaller and permitted the gradual accumulation of imported stocks, although in practically all cases American goods are commanding a premium in price over the foreign. At the Exposition in September, a birds-eye view of the recent developments in the American industry which have made this condition possible—considered absolutely impossible ten years ago by all the leading authorities—will be presented. The spirit of the new chemical America will be epitomized in the 1923 Chemical Exposition. As a direct result of the Ruhr occupation, the Fordney tariff, and generally renewed business activity in the United States, early indications point to the Exposition this year in New York as a record breaker and a direct reflection of renewed prosperity in the American chemical industry.

CANADIAN AUTOMOBILE INDUSTRY, 1922.

Statistics compiled by the Dominion Bureau of Statistics on the automobile industry of Canada for 1922 show that the amount of capital invested in the industry was $40,060,269; wages amounted to $13,331,084, and fuel consumed was valued at $703,736. A total of 101,007 autos were manufactured in the year, 53 per cent. more than in 1921, and 7 per cent. above the maximum of any previous year.

IN THE PULP AND PAPER INDUSTRY.

A special session of the Newfoundland legislature was called on the 6th of June to confirm the pulp and paper deal with the Armstrong Whitworth Co., whereby the Colony guarantees principal and interest of $8.000,000 for the establishment of a 400 ton mill on the west coast, the British Government having agreed to guarantee a similar amount. This was one of the main issues in the recent elections.

Control of Belgo Co. Transferred to Canada.

The control of the Belgo Paper Co. of Shawinigan Falls, has been transferred to Canada with the formation of a new company known as the Belgo-Canadian Paper Co., Ltd. The board of directors is as follows: Hubert Biermans, president and general manager; Sir Herbert Holt, vice-president; John Stadler, chief engineer and manager; Francois Faure, manager forestry department; J. W. Ross, director of the Sun Life Assurance Co. and Molsons Bank; C. E. Taschereau, M.P., director Quebec Railway and Banque Nationale; Harry Newman and R. O. Sweezey, both of Newman, Sweezey & Co., consulting engineers; and J. H. Gundy, of Wood, Gundy & Co. The financing consists of the issue of $8,000,000 first mortgage, 20-year, 6 per cent. bonds, and $4.000.000 7 per cent. cumulative preferred stock.

Large Increase in Exports of Newsprint.

Exports of newsprint for the month of May amounted to 98,901 tons, of which 98,531 went to the United States and 343 to New Zealand. The first five months of this year have witnessed a large increase in our newsprint exports over the corresponding period of the last two years, being 23 per cent over those of last year and 65 per cent. over those of 1921.

Technical Section, Canadian Pulp and Paper Association Hold Annual Summer Outing.

On June 21st and 22nd the members of the Technical Section of the Canadian Pulp and Paper Association followed their usual good custom of forgetting all cares and worries for a couple of days, and going on an instructive vacation.

About 40 members left Montreal on Thursday morning and motored out to Ste. Anne de Bellevue, following the picturesque route along the shore of Lake St. Louis. At Ste. Anne the party were shown through the plant of the Garden City Press, which is the home of "Pulp and Paper Magazine of Canada," the official organ of the Section. At lunch they were the guests of Mr. J. J. Harpell, president of the Garden City Press, at the Senneville Country Club. After lunch there was a solid hour of business, J. O. Ross, of the J. O. Ross Engineering Co., reading a paper on the Briner economizer, a device for recovering partially or totally the heat carried away from the paper machine by the hot air used in removing the vapors produced in the machine room. The performance of the economizer under various conditions was shown by quoting figures obtained in several mills which are equipped with the device.

The party then proceeded back to Ste. Anne where a launch was waiting to bring them across Lake St. Louis to Beauharnois. Here they were shown through the mill of the Howard Smith Paper Mills, Ltd. The company owns three mills, but it is at the Beauharnois plant that the highest grades of paper are turned out. It was a revelation to even some of the older members to see the scrupulous cleanliness which was maintained throughout the establishment and the care with which the stock was handled. It could almost be said that it was handled with silk gloves.

The party returned to Lachine and motored back to Montreal, where they were the guests of the Canadian Pulp and Paper Association at dinner at the Ritz-Carlton. In the course of the usual after-dinner speeches, Geo. Carruthers gave special credit to J. N. Stephenson, editor of the Text-Books being prepared by a joint committee of the Canadian Pulp and Paper Association and of the Technical Association of the Pulp and Paper Industry of America, who has worked, and is still working very hard to make them the vesy best work on the subject. A. P. Costigane dwelt upon the importance of properly training the man in the industry; for no matter how abundant the raw materials and how wonderful the equipment, we should surely be outdistanced by European countries if we did not train brains to operate the machinery and utilize the raw materials in an economical and efficient manner. Roy S. Kellog, of the Newsprint Service Bureau, sounded a note of warning on the subject of conservation of our main raw material—pulpwood. Wood has been used as a papermaking material only for the last 50 years; and it is only since it has been used that there has been sufficient paper to meet the demand. It is to this fact that we owe the widespread diffusion of knowledge and facilities of education which we witness to-day. Though there was a lot of talk about shortage of pulpwood, the fact of the matter is that only 8 per cent. of the wood consumed in America is used for making paper. The trouble is due to the fact that only a few species of slow-growing wood are used for this purpose, and the supply of these woods is rapidly diminishing.

Friday morning was spent visiting the plant of the Dominion Engineering Works, Lachine, P.Q., where several interesting contracts are at present being filled, including a 230-inch Fourdrinier machine for the Belgo-Canadian Paper Co.. which is to be delivered in running order on November 1st, and another machine for the new Backus-Brooks mill at Kenora, Ont. The Dominion Engineering Works have the distinction of having constructed the first paper machine in Canada (now running in the Beauharnois mill of the Howard Smith Paper Mills), and also the two fast newsprint machines of the Laurentide Co. at Grand' Mere, which are running steadily at over 1,000 feet a minute.

FOREST FIRES CAUSE SERIOUS LOSS IN EASTERN CANADA.

Forest fires have been exceptionally bad for this time of the year in Eastern Canada. Last year approximately 600,000 acres were burned over in the Province of Quebec, while this year in one month 400,000 acres have already been burned over, and the fires are still burning fiercely in many quarters. Torrential rains are about the only thing that could effectually put them out. Several settlements have been partially or totally wiped out.

Fire has wrought great havoc in the Province of New Brunswick, and has swept through the richest virgin forests of the province. A number of houses and other buildings have been burned in the Tobique district, including portions of the village of Oxbow, and the settlements of Blue Bell and Everett.

"It's an ill wind that blows nobody good," and deplorable as the forest fires have been so far this year they seem to have had one good result. They have apparently aroused our legislators to a realization of the importance of doing something to save what still remains of our forests, and to do it quickly. Hon. W. S. Fielding, Minister of Finance, recently gave the House notice of a resolution which declares that the export act will be amended "by the pre-war rates. The cost of mining supplies has risen gradually and in January, 1923, they stood at about 12 per cent. in advance of the quotations of 1922.

DEVELOPING QUEBEC'S NEW GOLD FIELD.

A group of prospectors who have been working all winter in the Quebec gold field near Pelletier Lake, south of Amos, report on work accomplished. Work done indicates that this camp is undoubtedly the extension of the Porcupine field, for values obtained and geology appear similar in character. Veins discovered average about three feet in width on the surface and one was almost six feet at the 35-foot level. Values are by no means spectacular, but the average is quite consistent, running between $9 and $11 a ton for channel samples. Should the present year's development bear out conclusions reached by surface work, indications would justify the erection of several big mills.

BRANDRAM-HENDERSON TO ENLARGE PLANT.

It is understood that Brandram-Henderson, Ltd., intends to add to its existing manufacturing facilities by the erection in Montreal of a modern varnish and enamel plant. To fund in part the cost of this new construction, and also to finance expenditures for other additions and extensions, the company has sold to the Royal Securities Corporation, Ltd., $200,000 of 6 per cent. consolidated mortgage bonds. These bonds mature March 15, 1939, and are part of a previously unissued balance of the $1,250,000 par value authorized in 1919.

BRITISH COMPANY WILL ESTABLISH ARTIFICIAL SILK PLANT IN CANADA.

The British silk manufacturing firm of Courtaulds has decided to establish a large plant in the Province of Quebec shortly, near Quebec city, for the manufacture of artificial silk yarn.

ATTEMPTED STRIKE FAILS.

An attempt to precipitate a general strike in the asbestos field, early in June, failed. A demand for an eight-hour day instead of the present ten hours, with the same rate of pay, was submitted to the Consolidated Asbestos Co., and flatly turned down. Of the 360 men employed only 40 went off work, 12 of whom are considered as actual strikers and the balance are believed to have been intimidated.

SERIOUS FIRE AT THETFORD ASBESTOS MILL.

Damage estimated at $300,000 was caused by fire that broke out in the main mill of the Asbestos Corporation of Canada plant at Thetford Mines early in the evening of June 15th. The flames spread with such rapidity that in a short time the greater portion of the plant had been reduced to ashes. It is stated that the fire was the result of an overheated bearing on one of the larger machines in the mill. For a time it was feared that the flames would spread to the new mill that the Asbestos Corporation is erecting on the opposite side of the railway tracks. The bridge connecting the old and new mills was partially destroyed, but the flames were arrested before they caught on the newly-erected buildings.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Concentration of Minerals—W. O. Borcherdt, 232151, June 19, 1923.

Concentration of Oxidized Ores—W. O. Borcherdt, 232150, June 19, 1923.

Filtration of Minerals—W. O. Borcherdt, 232149, June 19, 1923.

Concentration of Minerals—W. O. Borcherdt, 232148, June 19, 1923.

Treatment of Concentrates—W. O. Borcherdt, 232147, June 19, 1923. A concentrate containing colloidal constituents is given a deflocculation treatment for dispersing the colloidal constituents and the mineral is separated from the dispersed colloids gangue and the bulk of the water by "hindered" settling.

Froth Breaking Devices—W. O. Borcherdt, 232146, June 19, 1923. A disc having a roughened surface is mounted for rotation about a horizontal axis in a flotation apparatus.

Flotation of Minerals—W. O. Borcherdt, 232145, June 19, 1923. The differential flotation of minerals is effected by adding to the pulp a small amount of a colloid which of itself possesses the property of inhibiting the flotation of one mineral while permitting the flotation of another, and subjecting the pulp to flotation. The pulp remaining is treated to remove the dispersed colloid so as to promote flotation of another metal and then subjected to flotation.

Production of Alumina—B. F. Halvorsen, 232110, June 19, 1923.

The Dry Reduction of Iron—P. Farup, 232109, June 19, 1923. In the reduction of Fe ore in the form of briquets or powder in an atmosphere of CO, the reduced mass is cooled in an atmosphere containing relatively little CO.

Stabilized Metaldehyde—E. Luscher, 232079, June 19, 1923. Metaldehyde is stabilized by treating it with NH_3 or $(NH_4)_2CO_3$.

Recovering an Element Capable of Forming a Haloid from Ores—H. S. Booth and G. G. Marshall, 231954 and 231955. June 19, 1923.

Producing Cyanamide Solutions—J. H. Lidholm, Can., 230002, Apr. 3, 1923. Cyanamide solutions practically free from dicyandiamide are produced by circulating an aqueous solution of cyanamide in a closed system gradually adding $CaCN_2$ at one point and CO_2 at another point and thoroughly agitating the mixture.

Alloying Zinc with Iron or Steel—B. F. Dimp, 231949, June 12, 1923. An Fe or steel body is coated with Zn by any galvanizing process and then heated to 400-600° F until the zn coating, except for a small residue of dross and a thin film of $ZnCO_3$ is absorbed by and alloyed with the metal body from its surface inward.

Metallic Compositions or Alloys—H. Boving, 231942. June 12, 1923.

Method of Lining Electric Induction Furnaces—J. Funck, 231941, June 12, 1923.

Crude Cyanid Compounds—H. Freeman, 229767, Mar. 27, 1923. A compound contaniing stable $CaNa_2(CN)_4$ is prepared by heating a mixture of NaCl $CaCN_2$ and any substance containing C which will give up its C during heat treatment, the mixt. containing only sufficient Na Cl to combine with one-half the N in $CaCN_2$. The product is then rapidly cooled to prevent the reverse reaction taking place.

Manufacture of Hydrogen, Nitrogen and Carbon Dioxide—John Harger, 231936, June 12, 1923. Steam is passed over Fe which it oxidizes, a reducing gas is passed over the oxidized material which it reduces and produces a spent reducing gas, and a hot reducible metallic oxide, such as that of Cu, arranged in heat interchange relationship with the Fe material, is alternately reduced and oxidized. The gases are collected and purified and the spent gas may be converted into a reducing gas by passing it through incandescent fuel.

Apparatus for Exothermic Catalytic Reaction—I. W. Cederberg, 231684, June 5, 1923. An app. for the oxidation of NH_3 has a tubular catalyst chamber which is made of a series of metal rings tightly fitting together and forming annular flanges within and around the outside of the chamber.

Oxidation of Nitrogen in Electric Furnaces—O. Jensen, 231671, June 5, 1923. In the production of N products by the circulation of gases through an elec. furnace the gases from the absorption tower are brought into direct contact with a cooling liquid and then heated to such a temperature that no condensation will take place in the pipes or machinery.

Production of Ammonia—I. W. Cederberg, M. Fjellanger and V. Gurner, 231670, June 5, 1923. N and H are passed under pressure in contact with a catalyst produced from complex iron-cyanides that are insoluble in water and are free from soluble simple Fe salts.

Synthesizing Ammonia—E. H. Arnold and W. T. Wakeford, 231668, June 5, 1923.

Hydrofluoric Acid—H. Howard, 231655, June 5, 1923. A mixt. of fluorspar and H_2SO_4 is distilled and the gaseous products are scrubbed with a solution of K_2SO_4 to remove the H_2SiF_6 from the HF. The K_2SO_4 may be recovered for reuse by distilling the K_2SiF_6 with H_2SO_4.

Evaporating Sulfite Cellulose—E. Wirth-Frey, 231625, June 5, 1923. Sulfite lyes are maintained alkaline during the entire period of evaporation. $CaSO_4$ is removed by the introduction of CO_2.

Phosphoric Acid and Ammonia—F. G. Liljenroth, 231570, June 5, 1923. P and N are combined directly to form nitride which is treated with H_2O to form H_3PO_4 and NH_3.

Storage Battery Electrolytes—R. E. Banks, 231150, May 15, 1923.

Vulcanizing Rubber—R. P. Rose, 231086, May 15, 1923. C. activated by heat treatment at 1,000° for 90 minutes, is added to rubber and the mixt. vulcanized.

Reducing Ores in Electric Blast Furnaces—E. Fornander, 231378, May 29, 1923.

Composite Titanic Oxide Products—L. E. Barton. 231297, May 22, 1923. A composite pigment product containing $BaSO_4$, TiO_2 and Na_2SO_4 is produced charging an artificially prepared $BaSO_4$ into a $Ti_2(SO_4)_3$ solution heating to ppt. the basic sulphate, withdrawing the resulting conglomerations of sulphates and calcining them.

Flotation Agents and Method of Producing the Same—R. E. Sayre, 231290, May 22, 1923. A flotation agent consisting of a ketone condensation product and one or more thiourea compounds, one of which is thiocarbonilid, is produced by adding an amine and CS_2 to a solvent containing ketone condensation products and causing the combination of the amine and CS_2 to produce a thiourea compound in the solvent.

"BUSINESS AS USUAL" IN SPITE OF FIRE LOSS.

Regrets were displaced with congratulations when it was learned that the recent fire which occurred on June 24th at the plant of the Canadian Industrial Alcohol Company at Corbyville, destroying one of their large warehouses and some of their smaller buildings, did not in the slightest curtail the activities of the organization, that not one moment's delay occurred in the filling of orders, and that "business as usual" prevailed, thanks to a managerial policy of vision and forethought.

Although a huge quantity of pure and denatured alcohol was destroyed, not the slightest inconvenience was caused the trade for the company had in storage in other buildings a supply of alcohol sufficient for the entire requirements of all Canada for the period of a year—probably a policy unexampled in any industry, of making provision for future emergencies.

The fire had hardly subsided before plans were under way for the reconstruction of the destroyed units and it was learned with interest that such plans are to harmonize with a policy of expansion which the Canadian Industrial Alcohol Company, Limited, is carrying out, involving the expenditure of enormous sums.

Commitment to such an unusual and major policy of expansion not only augurs well for the welfare of the alcohol industry and its anticipated large future growth, but gives a healthy indication of the confidence which Canadian manufacturers have in the industrial future of our country.

INTERNATIONAL NICKEL CO. RECOVERING FROM BUSINESS DEPRESSION.

Earnings of the International Nickel Co. for the year ended March 31st, 1923 showed a distinct improvement over the preceding year, although still below figures reached in 1920 and 1921. The last year was one of gradual recovery from the business depression which became most acute in 1921, and net profits after deduction of all charges, taxes, depreciation and depletion, amounted to $48,170 against a loss the preceding year of $1,335,581. In 1921 and 1920 the net profits were $2,029.700 and $2.745,734 respectively.

CATALOGUES RECEIVED.

Catalogue F. No. 123, Physical Apparatus and Instruments—Central Scientific Company, Chicago, Ill. This is the latest catalogue issued by this company, descriptive of their physical apparatus, including tools and raw materials used in demonstrating the laws of physics and mechanics and for use in mechanical engineering laboratories. Every article is illustrated and carefully described and the entire catalogue is of the usual high class maintained by this company in all their publications.

West End Chemical Co., Oakland, Cal.—This company have issued a booklet describing the progress made in the opening of their new borate mine at Las Vegas, Clark County, Nevada. Refineries are operated at San Francisco and Chauncey, New York. The principal products of the company are borax and boric acid. The president of the company, Mr. F. M. Smith, was a pioneer in the American borax industry, having initiated the industry in 1872 at Teels Marsh, Nevada, and ten years later commenced the development of the colemanite deposit in Death Valley, Nevada. The development of the borax industry forms an interesting romantic chapter in the history of chemical industries.

Chemical Oil and Metal Market

CHEMICALS.

The chemical market in Canadian centres, as in the United States, continues rather quiet. During the first part of June there was a little increased activity, but this has given way to the usual passive summer period. Not only is buying limited to only present requirements, but both manufacturers and dealers have ceased pressing for sales. The general attitude on the part of both consumers and makers seems to be a readiness to allow the summer quietness to have its way. Demand from the various consuming industries is only for immediate needs in most cases. The steel industry is probably the best customer, with the paint and varnish a good second. Dullness in the textiles has slowed down demand considerably from this source. The firm tone to alkalis and heavy acids, however, gives a steadiness to the market that would otherwise be lacking.

There is not a single advanced quotation recorded in any of the industrial chemicals during the past month, but declines have not been as numerous as one might think, considering the poor demand from many quarters. Lump and ground alum is quoted at 50c. per cwt. less than June 1st prices. Copper sulphate is weaker by ½c. per lb, due to the weak position of the metal. Arsenic has receded from its former high levels, and is now quoted at from 13½ to 15c. per lb. Pharmaceuticals and fine chemicals are in a somewhat stronger position than last month. Coumarin is advanced 50c. per lb. and phenolphthalein 25c. per lb. Carbolic acid white crystals are still scarce and have advanced again, present quotations ranging from 42c. to 45c. per lb. Sodium iodide is also rather scarce, and some dealers are quoting as high as $5.25 per lb.

British Market.—In industrial chemicals the British market continues dull, but considerable improvement is noted in fine chemicals and pharmaceuticals. The continued unsettled state of the chemical industry in the Ruhr valley has assisted in strengthening the British fine chemical market.

Metals.

Business continues good in the iron and steel market, and the industry enters the second half of the year with practically undiminished prospects. The American railways are placing large orders for steel, a most hopeful sign indeed in the face of some talk of a coming industrial slump. Steel prices are steady and show no sign of declining during the immediate future at least. Copper, lead, and zinc all show lower prices at the beginning of July than at June 1st; hut producers are optimistic as to the future position of these metals.

CURRENT CANADIAN MARKET QUOTATIONS ON CHEMICALS, GUMS, OILS AND METALS.

GENERAL CHEMICALS

Acetaldehyde, 99%, carlots, 20,000 lbs. and over	lb.	.15	—
Less than carlots	lb.	.16	—
Both quotations f.o.b. Shawinigan Falls, Que.			
Acetone, pure, drums or over	lb.	—	.27
Lesser amounts	lb.	—	.34
ACID—			
Acetic, 28%, car. lots	100 lbs.	—	4.80
28%, 25 bbl. lots	100 lbs.	—	5.05
28%, 10 bbl. lots	100 lbs.	—	5.30
28%, 5 bbl. lots	100 lbs.	—	5.55
28%, 1 or 2 bbl. lots	100 lbs.	—	5.80
80%, carload lots	100 lbs.	—	13.20
80%, 25 bbl. lots	100 lbs.	—	15.20
80%, 15 bbl. lots	100 lbs.	—	16.20
80%, 10 bbl. lots	100 lbs.	—	16.75
80%, 5 bbl. lots	100 lbs	—	17.20
80%, 3 or 4 bbl. lots	100 lbs.	—	18.20
80%, 1 or 2 bbl. lots	100 lbs.	—	18.50
Glacial, bbls		—	.12
Carboys	lb.	—	.12½
Boric, crystals, bbls	lb.	—	.13
Boric, powder, bbls	lb.	—	.12½
Benzoic	lb.	.85	— .90
Butyric, 98-99% pure, f.o.b. Shawinigan Falls	lb.	1.00	—
Citric, kegs	lb.	.45	— .55
Formic, 75%, carboys, 100 lbs.	lb.	.20	— .22
Gallic, tech	lb.	.50	— .55
Gallic, B. P.	lb.	1.25	— 1.50
Hydrochloric, 18°, carboys, 100 lbs	lb.	2.25	— 2.75
Hydrofluoric, 60%	lb.	.22	— .25
Hydrofluoric, 30%	lb.	.11	— .13
Lactic, 44%, tech., light, bbl.	lb.	—	
Lactic, 22%, tech., light, bbl.	lb.	—	
Muriatic, see acid hydrochloric.			
Nitric, 36°, carboys	100 lbs.	8.25	— 8.50
Oleic	lb.	—	.26
Oxalic	lb.	.15	— .18
Phosphoric, 85%	lb.	—	.28
Phosphoric, 50%	lb.	—	.22
Pyrogallic, resublimed	lb	2.00	— 2.10
Salicylic, tech., bbl	lb.	.47	— .48
Salicylic, B.P. bbl	lb.	.50	— .52
Sulphuric, 66°, carboys	100 lbs.	2.25	— 2.75
Sulphuric, 66°, tank cars, f.o.b. works	ton	23.75	—24.00
Stearic, double pressed	lb.	.22	— .24
Stearic, triple pressed	lb.	.25	— .27
Tannic, B.P.	lb.	.80	— .90
Tannic, tech	lb.	.45	— .55
Tartaric, crystals, bbls	lb.	.32	— .35
Tartaric, powder, bbls	lb.	.33	— .36
ALCOHOL, absolute Ethyl, case of 1 doz. 1 lb. bottle		—	3.15
In steel drums of 10 gals. capacity	Imp. gal.	—	23.00
Acetone, bbls. or over	gal.	—	1.15
Lesser amounts	gal.	—	1.45
Aldehyde Ammonia	lb.	—	.75
Alum, Ammonia, lump or ground	100 lbs.	4.00	— 5.00
Aluminium Sulphate, lump bags	100 lbs.	2.25	— 2.50
Ground, bags	100 lbs.	2.50	— 2.75
Iron, free	100 lbs.	—	4.00
Ammonia, aqua, 26°, carboys	lb.	.13	— .14
Drums	lb.	—	.09½
AMMONIUM, Carbonate	lb.	.12	— .15
Chloride	lb.	.10	— .13
Amyl Acetate, tech	gal.	—	4.00
Pure	lb.	—	.80
Arsenic, white	lb.	.13½	— .15
BARIUM, Sulphate, B.P.	ton	—	60.00
Chloride	lb.	.06	— .08
Nitrate	lb.	—	.16
Peroxide	lb.	—	.26
Blanc fixe, dry, bbl	lb.	—	
Pulp, bbl	ton	—	
Bleaching Powd., 35%, drums	lb.	2.50	— 3.00
Borax, crystals	lb.	.06½	— .06¾
Bromine, tech	lb.	—	.38
Benzaldehyde	lb.	1.35	— 1.60
Butylaldehyde	lb.	.60	—
CALCIUM ACID, Phosphate	lb.	—	.07½
Carbide, ton lots, f.o.b. wks	ton	—	95.00
Carbide, less than ton lots	ton	—	100.00
Chloride, fused	ton	—	31.00
Chloride, flake	ton	44.00	—48.00
CAUSTIC SODA, flake, drms.	100 lbs.	5.00	— 5.50
Ground, drums	100 lbs.	5.00	— 5.50
Solid, drums	100 lbs.	4.25	— 4.75
CARBON BISULPHIDE, drums	lb.	.12	— .13
Tetrachloride, drums	lb.	—	.15
Chlorine, liquid, in cylinders of 150 lbs	lb.	.08	— .09
Cobalt Oxide, black	lb.	—	2.00
Grey	lb.	—	2.25
Copperas, crystals	lb.	.02	— .02¼
Sugar	lb.	.02	— .02¼
Copper Sulphate (blue vitriol)	lb.	.07½	— .08
Corrosive Sublimate	lb.	1.15	— 1.20
Dextrine, potato	lb.	—	.06
Corn	lb.	—	.08½
ETHER, B.P. (conc.)	lb.	—	.55
Sulphuric	lb.	.30	— .35
Ferric Chloride, crystals	lb.	.13	— .14
Solution	lb.	—	.10
Formaldehyde, bbls. or over	lb.	—	.19½
200-lb. kegs	lb.	—	.24½
100-lb. kegs	lb.	—	.25½
50-lb. kegs	lb.	—	.26½
Fullers' Earth, powder	100 lbs.	2.00	— 2.50
Car lots, f.o.b. Toronto	ton	—	30.00
Fusel Oil, special, refined	gal.	4.00	— 4.50
Glycerine, crude, drums	lb.	—	.15
Crude, single tin of 56 lb.	lb.	—	.17
C.P., single tin of 56 lbs.	lb.	—	.29
C.P., two or more tins	lb.	—	.27
C.P. drums, 500-1,000 lbs.	lb.	—	.21
Pale straw, drums, 500-1,000 lbs	lb.	—	.20
Pale straw, single tin 56 lb.	lb.	—	.28
Pale Straw, 2 or more tins	lb.	—	.26
Hexamethylene Tetramine	lb.	—	.90
Hydrogen Peroxide	gal.	.70	— .75
Iron Oxide, red, casks	lb.	.13	— .20
LEAD, Acetate	lb.	.14	— .16
Nitrate	lb.	.14	— .15
Lime, grey	ton	—	14.30
Grey, in car lots	ton	—	11.70
Hydrated, in ton lots	ton	—	20.00
Litharge	lb.	.09	— .10
Lithopone	lb.	—	.07½
Magnesite, Calcined	ton	—	30.00
Clinkered	ton	—	35.00
Raw	ton	—	10.00
MAGNESIUM, Carbonate, bbls.	lb.	.14	— .16
Sulphate, B.P.	ton	60.00	—70.00
Technical, car lots	ton	45.00	—50.00
Methyl Hydrate (wood Alcohol), 95%, bbls. or over	gal.	—	1.15
95%, half-bbl. lots	gal.	—	1.25
95%, lesser amounts	gal.	—	1.30
97%, bbls	gal.	—	1.20
97%, half-bbl. lots	gal.	—	1.35
97%, lesser amounts	gal.	—	1.50
Nickel Salt, single, in bbl. lots	lb.	—	.13½
Single, per cwt	lb.	—	.15
Double, barrel lots	lb.	—	.14
Double, per cwt	lb.	—	.15½
Phosphorus, yellow	lb.	—	.34
Potash Prussiate, yellow	lb.	.32	— .34
POTASSIUM, Bicarbonate	lb.	—	.20
Bichromate	lb.	.17	— .18
Carbonate, calc. 80-85%	lb.	—	.11
Chlorate	lb.	—	.10
Citrate	lb.	.90	— 1.00
Hydroxide (caust. potash)sticks		—	.45
Hydroxide (caustic potash), small drums	lb.	.10	— .15
Hydroxide (caustic potash) large drums	lb.	.09	— .10
Nitrate, casks	lb.	.10	— .12
Permanganate, bulk	lb.	.19	— .20
Red Precipitate (mercuric ox.)	lb.		— 1.75
Silver Nitrate	lb.	—	9.00
Soda Ash, bags	cwt.	2.25	— 2.40
SODIUM, Acetate, ton lots or ov.	lb.	—	.08
Lesser amounts	lb.	—	.08½
Aluminium Phosphate	lb.	—	.03½
Benzoate	lb.	.70	— .85
Bicarbonate, 100% pure	lb.	2.50	— 3.00
Bichromate, bbls	lb.	.10	— .13
Bisulphite, powder	lb.	.05½	— .06
Bisulphite, 35 Be	lb.	.03	— .03½
Bromide (foreign)	lb.	—	.28
Cyanide, bulk, 98-99%, in cases	lb.	—	.34
Fluoride, 95-98%	lb.	.15	— .16
Hyposulphite, kegs	100 lbs.	4.75	— 5.00
Barrels	cwt.	4.00	— 4.50
Iodide	lb.	—	5.20
Nitrate, refined	cwt.	6.75	— 7.00
Crude, 95%	cwt.	5.25	— 5.75
Nitrite	lb.	.12	— .15
Perborate, U.S.P.	lb.	.35	— .40
Peroxide, f.o.b. New York	lb.	.30	— .35
Silicate, 42°, car lots	cwt.	—	1.35
Smaller lots	cwt.	—	1.55
Silicate, 40°, car lots	cwt.	—	1.25
smaller lots	cwt.	—	1.45
Sulphide, 60-62% fused	lb.	.08	— .09
Sulphate (Glauber's Salts), crystals, in bags	cwt.	1.80	— 2.00
Car lots	cwt.	1.65	— 1.75
Sulphite	lb.	—	.02
Prussiate, yellow	lb.	.24	— .25
Sulphur, ground	100 lbs.	2.50	— 2.75
Roll	100 lbs.	4.25	— 4.75
Talc, No. 1 grade	ton	—	30.00
No. 2 grade	ton	—	25.00
No. 3 grade	ton	—	23.00
Tin Chloride, crystals	lb.	.30	— .35
Tri-Sodium Phosphate	lb.	.07	— .07½
Ultramarine, blue	lb.	.10	— .29
White Precipitate (mercuric-Ammonium chloride)	lb.	—	1.85
Whiting (English)	ton	—	30.00
(American)	ton	—	28.00
ZINC, Sulphate, com	lb.	.05	— .05½
Dust	lb.	.13	— .14½
Oxide, lead free	lb.	.11	— .12
Stearerate	lb.	.30	— .35

PHARMACEUTICAL CHEMICALS

AMMONIA, Aqua, C.P.	lb.	—	.22
Iodide	lb.	—	6.25
Asperin, 100 lb. lots, bulk	lb.	.85	— .95
Caffeine, English	lb.	—	3.50
Calomel (mercurous chloride	lb.	1.50	— 1.60
Camphor, Monobromate	lb.	—	2.60
Refined, slabs	lb.	—	1.28
Refined, Tab	lb.	—	1.32
Carbolic Acid, white crystals	lb.	.42	— .45
Chloroform	lb.	.45	— .55
Coumarin	lb.	3.75	— 4.00
Cream Tartar, 98%	lb.	.25	— .30

Ether, B.P.	lb.	—	.55
Iodine, crude	lb.	4.50 —	4.75
Resublimed	lb.	5.50 —	5.60
Lithium Carbonate	lh.	1.80 —	2.10
Potassium Bromide, crystals	lb.	.28 —	.34
Granular	lb.	.28 —	.34
Iodide	lb.	—	4.40
Phenacetin	lb.	1.75 —	2.00
Phenolphthalein	lb.	—	1.75
Quinine	oz.	.70 —	.75
Saccharin	lb.	1.75 —	2.25

SYNTHETICS

Benzyl, Acetate	lb.	—	1.75
Benzoate	lh.	—	1.75
Citral	lb.	—	4.50
Coumarine	lb.	—	3.50
Heliotropine	lb.	—	5.00
Linalyl Acetate	lb.	—13.	50
Methyl Salicylate	lb.	—	.75
Musk, Xylol	lb.	—	3.00
Teyseniol	lb.	—	1.00

ESSENTIAL OILS

Anise	lb.	—	.80
Bay	lb.	—	3.00
Bergamot	lb.	—	4.50
Cajaput	lb.	—	1.25
Camphor, white	lb.	—	.50
Brown	lb.	—	.25
Cassia	lb.	—	2.00
Cedar Leaf	lb.	1.90 —	2.00
Cedar Wood	lb.	—	.50
Citronella, Ceylon	lb.	—	.60
Java	lb.	—	.85
Clove	lh.	—	2.25
Eucalyptus	lb.	—	.65
Geranium Bourbon	lb.	—	7.50
Lavender	lb.	—	5.00
Spike	lb.	—	1.25
Lemon	lb.	—	.75
Lemongrass	lb.	—	1.35
Lime, distilled	lb.	—	1.00
Orange Sweet, Sicilian	lb.	—	3.50
West Indian	lh.	—	3.00
Peppermint, American	lb.	—	3.50
Japanese	lb.	1.75 —	2.00
Redistilled, B.P.	lb.	4.00 —	4.25
Pathouli	lb.	—10.	00
Otto of Rose	lb.	—	6.50
Rosemary	lb.	—	.65
Sandalwood	lb.	—	7.50
Sassafras	lb.	—	1.75
Thyme	lb.	—	1.45

VEGETABLE OILS

Castor Oil, No. 3, bbl	lb.	—	
AA, bbl	lb.	—	
Cocoanut, Ceylon, bbl	lb.	—	
Cochin, bbl	lb.	—	
Corn Oil, bbls	lb.	—	.12
Tank cars	lb.	.10 —	.10½
Cottonseed Oil, crude, f.o.b. U. S. mills, tanks	lb.	.10 —	.10
Summer, yellow, bbl	lb.	.12 —	.12½
Winter, yellow, bbl	lb.	.13 —	.13¼
Linseed Oil, 1 to 2 bbls., Raw, per gal. of 9 lbs		—	1.35
3 to 5 bbls., Raw, per gal. of 9 lbs		—	1.34
6 to 9 hbls., Raw, per gal. of 9 lbs		—	1.32
Linseed Oil, 3c per lb. higher than raw		—	
Monopole Oil	lb.	.07 —	.16
Olive Oil, foots	lb.	.12 —	.14

GUMS

Arabic, clear amber sorts	lb.	—	.22
Regular grain No. 4 and No. 5	lb.	—	.30
Regular grain No. 2	lb.	—	.31
White sorts	lb.	—	.35
Powdered, No. 1	lb.	—	.40
Powdered, No. 2	lb.	—	.39
Indian, No. 1A	lb.	—	.28
No. 1	lb.	—	.25
Tragacanth, No. 1, ribbon	lb.	—	3.00
No. 1, flake	lb.	—	2.00
Turkey	lh.	—	2.00

VARNISH RESINS

Congo, sorts	lb.	.10 —	.11
Hard amber	lh.	.11½ —	.18
White	lh.	.35 —	.45
Damar, Batavia	lb.	.35 —	.38
Singapore, No. 1	lb.	.39 —	.45
Singapore, No. 2	lb.	.20 —	.24
Singapore, No. 3	lb.	.09½ —	.12
East India, pale bold	lb.	.22 —	.25
Pale nubs	lb.	.15 —	.17
Pale chips	lh.	.07 —	.12
Black bold	lh.	.09 —	.12
Black nubs and chips	lh.	.05 —	.08
Kauri, XXXXX	lh.	1.60 —	
XXXX	lb.	1.25 —	
XXX	lb.	1.10 —	
XX	lb.	.90 —	
X	lb.	.80 —	
No. 1	lb.	.67 —	.70
No. 2	lb.	.45 —	.50
No. 3	lb.	.25 —	.30
B. X	lb.	.55 —	.65
B. 2	lb.	.30 —	.35
No. 1 chips	lb.	.22 —	.27
Brown chips	lb.	.15 —	.20
Dust	lb.	.10 —	.15
Manila, Bold XXXXX	lb.	.21 —	.23
Nubs, pale	lb.	.18 —	.22
Nubs, amber	lb.	.10 —	.18
Soluble A	lb.	.16 —	.18
Soluble chips	lb.	.10 —	.12
Pontianac Bold	lb.	.20 —	.30
Genuine nubs	lb.	.14 —	.17
Genuine chips	lb.	.10 —	.12

WAXES

Bayberry	lb.	.35 —	.38
Beeswax, white, pure	lb.	—	.38
African	lb.	—	.30
Brazilian	lb.	—	.34
Chilean	lb.	—	.35
Refined	lb.	—	.31
Candelilla	lb.	.40 —	.42
Carnauba, No. 1, bags	lb.	—	.50
No. 2, North Country	lb.	—	.32
No. 3, North Country	lb.	—	.22
No. 3, chalky	lb.	—	.21
Ceresin, white	lb.	—	.12¼
Yellow	lb.	—	.12
Japan	lb.	.19 —	.20
Montan, crude	lb.	.06 —	.07
Ozokerite, crude, brown	lb.	.16 —	.17
Black, 158°—160°, M.P.	lb.	.18 —	.19
Paraffin, 128°—130°, M.P., 250 lb. lots	lb.	—	.06
118°—120°, M.P., 250 lb. lots	lb.	—	.05
Parowax, blocks, 100 lb. lots	lb.	—	.08¾

SHELLAC

T.N.	lb.	—	.85
Superfine Orange	lb.	—	.90
A. C. Garnet	lb.	—	.82
Bone Dry	lb.	—	.99

NAVAL STORES, FLOTATION OILS

Pine Tar Oil, crude	gal.	—	
Refined	gal.	—	
Double, ref.	gal.	—	
Rosin, G., 280 lb. bbl. lots	bbl.	—	8.25
W.W., 280 lh. bbl. lots	bbl.	—10.	50
Turpentine, 1 bbl. lots	Imp. gal.	—	1.60
2 to 4 bbl. lots	Imp. gal.	—	1.59
Less than bbl. lots	Imp. gal.	—	1.70

PETROLEUM OILS AND DISTILLATES

Mid-Continent Crude, 42 W. gal.	bbl.	—	1.45
Pennsylvania Crude, 42 W. gal.	bbl.	—	3.25
Coal Oil	gal.	—	.18
Fuel Oil, bbls	gal.	—	.11
Tank cars	gal.	—	.09
Gasoline, motor	gal.	—	.25
Service stations	gal.	—	.29
Gasoline, lighting	gal.	—	.30
Naphtha	gal.	—	.24

COAL TAR PRODUCTS

Alpha—Naphthylamin	lb.	—	.52
Benzol, 100%	Imp. gal.	—	.65
90%	Imp. gal.	—	.60
Carbolic Acid, crude, 30%	gal.	—	.40
Creosote Oil, crude	gal.	—	.40
Refined	gal.	—	.60
Coal Tar, crude	bbl.	—10.	25
Refined	bbl.	—11.	50
Coal Tar Pitch, bbls	cwt.	—	2.00
Cresol, U.S.P., f.o.b. N.Y.	lb.	.25 —	.27
Dep Oil, 25%, f.o.b. N.Y.	gal.	.25 —	.28
H. Acid, f.o.b N.Y.	lb.	—	.85
Phenol, drums	lb.	.60 —	.65
Pyridine, f.o.b. N.Y.	gal.	2.75 —	3.00
Resorcinol, tech, f.o.b. N.Y.	lb.	1.40 —	1.50
Pure, f.o.b. N.Y.	lb.	2.00 —	2.10
Naphthalin, flake	lb.	—	.09
Balls	lb.	—	.10
Solvent Naphtha, refined	gal.	—	.48
Toluol, pure	gal.	—	.54
Xylene, pure, f.o.b. N.Y.	gal.	.75 —	.85
Comm., drums, f.o.b. New York	gal.	—	.37

FERTILIZER MATERIALS

Acid Phosphate	ton	$28.00—	30.00
Animal Tankage, per unit of ammonia		—	3.50
Per unit of hone phosphate of lime		—	.10
Nitrate of Sode		65.00 —	70.00
Muriate of Potash	ton	—	40.00
Pure Ground Blood, per unit of ammonia		—	4.00
Steamed Bone Meal	ton	—	30.00
Sulphate of Ammonia	ton	68.00 —	70.00

TANNING AND DYEING MATERIAL

Chestnut Liquid Extract	lb.	.02½ —	.03½
Fustic Crystals	lb.	.24 —	.28
Ground Sumac	ton	70.00 —	75.00
Hematine Crystals	lb.	.18 —	.22
Hemlock Liquid Extract	lb.	.03½ —	.04
Liquid Sumac Extract	lb.	.06½ —	.07½
Logwood, Solid	lb.	.16 —	.19
Quebracho Liquid Extract	lb.	.03½ —	.04
Quercitron Liquid Extract	lb.	.07 —	.08

CRUDE RUBBER

The following quotations on Rubber are in American funds, New York delivery:—

Para, upriver fine	lb.	$ —	.28
Upriver, coarse	lb.	—	.23
Caucho ball	lb.	—	.25
Plantation, 1st latex crepe	lh.	—	.31
Ribbed smoked sheets	lb.	.35½ —	.35¾
Brown crepe, thin, clean	lb.	—	.29
Amber crepe, No. 1	lb.	—	.29½

MISCELLANEOUS MATERIAL

Asbestos, crude, No. 1, f.o.b. Quebec	ton	—500.	00
Shingle, f.o.b. Quebec	ton	70.00 —	80.00
Cement, f.o.b. Quebec	ton	21.00 —	25.00
Barytes, floated	ton	30.00 —	35.00
Crude, f.o.b. mines	ton	10.00 —	11.00
Casein, tech., bbls	lb.	.28 —	.30
China Clay, f.o.b. Huberdean, Que., car lots	ton	17.00 —	18.00
Imported	ton	20.00 —	23.00
Feldspar, No. 1, f.o.b. mill	ton	—22.	00
Fluorspar, ground	ton	25.00 —	28.00
Graphite, crude high grade	ton	35.00 —	45.00
Ceylon, lump	lb.	.06 —	.06½

INDUSTRIAL GASES

Acetylene, cylinders	100 cu. ft.	$2.55—	3.00
Coal Gas, cylinders	100 cu. ft.	3.00 —	4.00
Hydrogen, cylinders	100 cu. ft.	1.50 —	2.00
Nitrogen, cylinders	100 cu. ft.	2.00 —	3.00
Oxygen, cylinders	100 cu. ft.	1.50 —	2.00

METALS

Aluminium, 98-99%, 15 ton lots	lb.	—	.24
Antimony	lb.	—	.08¾
Brass, yellow ingots	lb.	—	.12
Red	lb.	—	.16½
Rods	lb.	—	.19
Cobalt	lb.	3.00 —	3.25
Copper electrolytic, small lots	cwt.	—17.	25
Car lots	cwt.	—16.	75
Casting, small lots	cwt.	—16	25
Casting, car lots	cwt.	—15.	75
Gold, pure	oz.	23.00 —	25.00
Iron, pig	ton	—34.	00
Bar iron, base	cwt.	—	3.75
Lead, pig, small lots	cwt.	—	7.10
Car lots	cwt.	—	6.60
Magnesium, ribbon	oz.	—	1.50
Ribbon	lb.	—18.	00
Powder	oz.	.60 —	.65
Monel Metal, machined rods	lb.	—	.50
Blocks	lb.	—	.34
Shot	lb.	—	.34
Sheet, hot rolled, on orders of over 500 pounds, of one gauge	lb.	—	.48
rods, hot rolled	lb.	—	.42
Rods, cold rolled	lb.	—	.53
Nickel, shot or ingot	lb.	—	.35
Platinum, pure	oz.	—124.	00
5% iridium	oz.	—128.	00
10% iridium	oz.	—138.	00
Silver, bar, American silver	oz.	—	.99¼
Bar, Canadian produced, U.S. funds	oz.	—	.67½
Steel, mild, ¼-inch, base price	cwt.	—	3.75
3/16-inch, base price	cwt.	—	4.25
Black sheet, 28 gauge, size 30"	cwt.	—	5.65
Black sheet, 28 gauge, size 36"	cwt.	—	5.75
Sheets, galvanized, 28 gauge, 30"	cwt.	—	6.75
Blue sheets, base	cwt.	4.50 —	4.60
Sheets, galvanized, 28 gauge, 36"	cwt.	—	7.00
Tin	lb.	—	.51
Zinc, sheets	lb.	—	.13
Zinc, (spelter), small lots	cwt.	—	7.85
Car lots	cwt.	—	7.35

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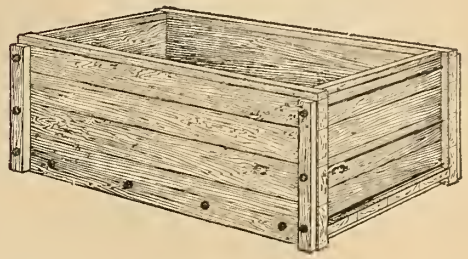

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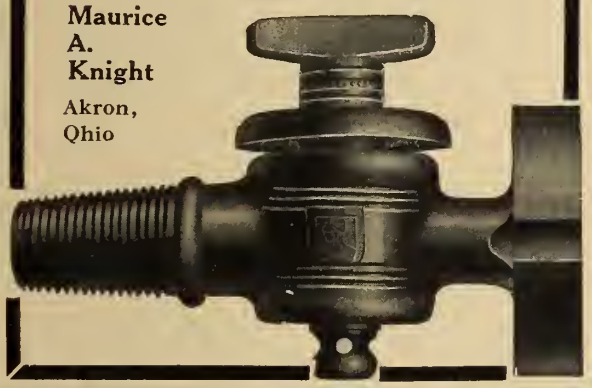

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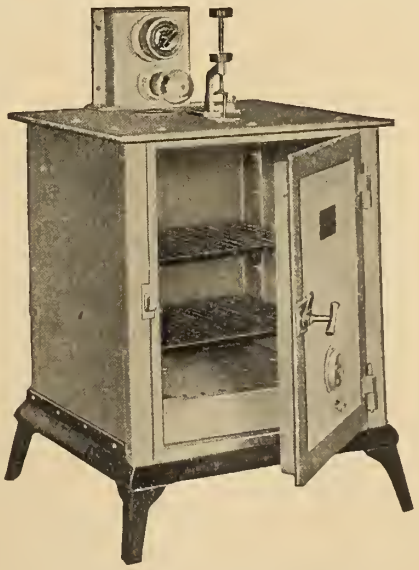

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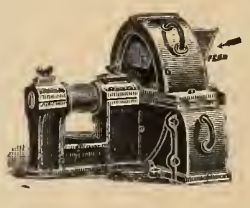

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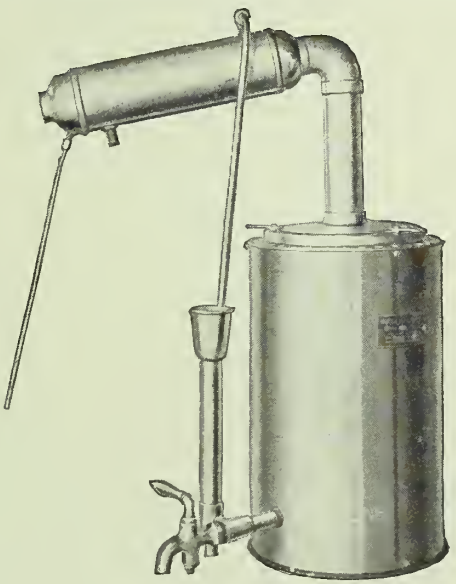

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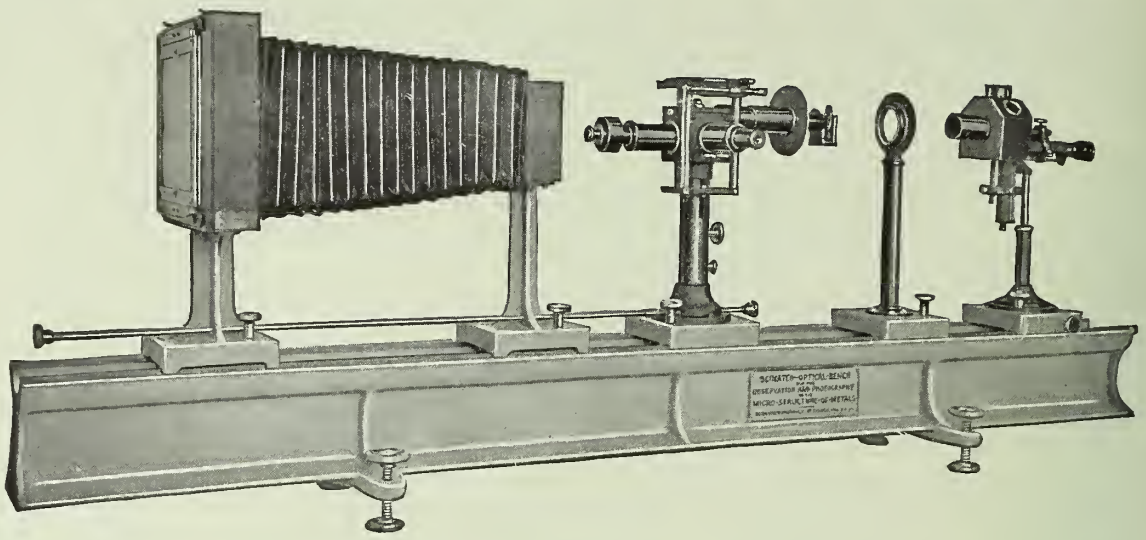

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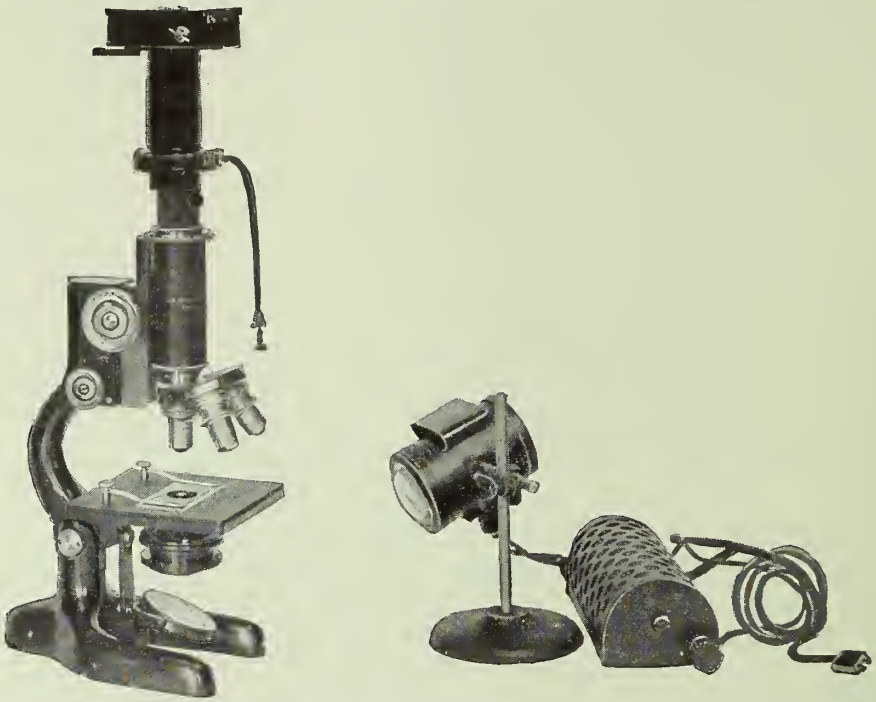

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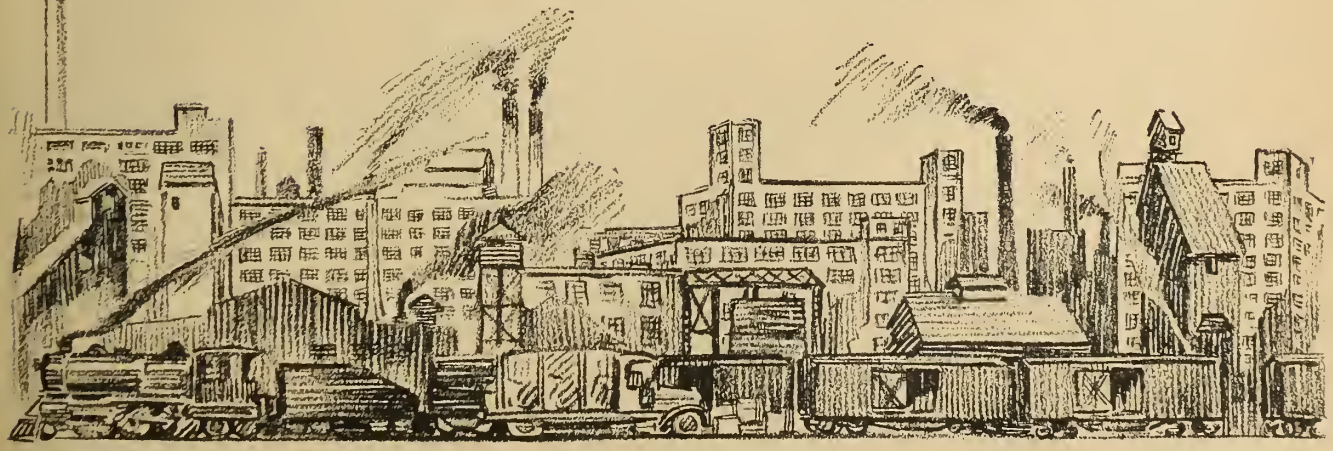

ONTARIO'S MINERALS

PROVINCE OF ONTARIO
DEPARTMENT OF MINES

Hon. Chas. McCrae, Minister. *Thos. W. Gibson, Deputy Minister.*

Preliminary Summary of Mineral Statistics

(Quantities represent shipments. Tons throughout are short tons of 2,000 pounds)

Product		1921 Quantity	1921 Value	1922 Quantity	1922 Value
METALLIC					
Gold	ounces	709,509	$14,624,085	$1,000,199	$20,674,109
Silver	"	8,412,059	5,497,160	9,167,846	6,491,271
Platinum metals (a)	"	915	51,060	642	38,884
Copper	lbs.	3,070,719	356,708	4,503,358	515,093
Nickel, metallic	"	5,430,147	1,825,359	11,175,326	3,171,434
Nickel, oxide	"	1,402,019	285,391	2,399,887	391,119
Cobalt, metallic	"	32,718	98,228	109,067	282,602
Cobalt, oxide	"	155,554	354,418	398,697	798,271
Other nickel and cobalt compounds and residues	"	108,814	114,069	1,070,935	255,034
Copper in matte exported (b)	tons	3,686	737,142	7,774	1,554,731
Nickel in matte exported (b)	"	4,850	1,939,851	8,689	3,475,649
Iron and briquettes (c)	"	100	459	4,304	25,261
Iron, pig (d)	"	82,838	2,079,729	14,052	340,730
Lead, pig	lbs.	3,570,222	190,843	2,895,695	173,742
Zinc (e)	"	.....	.....	100,283	2,181
Total metallic		.....	$27,574,202	.....	38,190,711
NON-METALLIC					
Actinolite	tons	78	$ 975	$ 50	$ 345
Apatite (Phosphate of Lime)	lbs.	.....	.....	31	248
Arsenic, white	"	2,982,525	233,763	4,118,695	299,940
Arsenate of Iron	"	.....	.....	75,000	938
Corundum	tons	402	50,250	.....	.....
Feldspar, crude and ground	"	15,506	114,059	15,515	94,985
Fluorspar	"	115	1,744	284	3,905
Graphite, crude and refined	"	363	23,273	626	34,124
Gypsum, crushed, ground and calcined	"	84,765	433,053	110,227	621,668
Iron Pyrites	"	19,375	91,604	11,235	39,763
Mica	"	222	29,630	2,229	56,480
Mineral water	Imp. gals.	.....	9,000	31,970	6,118
Natural gas	M. cu. ft.	8,590,000	2,953,000	7,919,390	3,902,800
Peat	tons	500	2,000	3,000	14,500
Petroleum	bbls.	172,859	466,716	164,732	439,286
Quartz and silica brick	tons	12,957	74,635	82,882	149,302
Salt	"	149,599	1,509,287	161,551	1,537,512
Talc., crude and ground	"	9,967	140,390	12,874	178,397
Construction Materials—($11,527,529)—					
Cement, Portland	bbls.	2,723,072	6,425,266	3,104,386	6,235,370
Lime	tons	91,355	1,172,680	116,769	1,315,479
Sand and gravel	cu. yds.	1,412,956	668,098	2,132,875	1,001,088
Sand-Lime brick	M.	.....	456,700	48,924	770,597
Stone, building, trap, granite		.....	1,812,863	.....	2,205,025
Clay Products—($5,103,618)					
Brick, common	M.	99,463	1,743,094	105,536	1,803,349
Brick, pressed	"	31,481	673,087	44,892	900,111
Brick, tapestry or rug	"			22,453	514,666
Tile, drain	"	9,910	250,040	10,110	260,312
Tile, building and floor		.....	211,529	.....	562,566
Pottery		.....	67,985	.....	88,889
Sewer pipe		.....	939,464	.....	973,824
Total non-metallic		.....	20,554,185	.....	24,011,458
Add metallic		.....	27,574,202	.....	38,190,711
Grand Total		.....	$48,128,387	.....	$62,202,169

(a) Recoveries from Canadian and United States refineries. (b) Copper and nickel exports in the form of matte were valued, respectively, at 10 and 20 cents per pound. (c) Exports and shipments to points other than Ontario blast furnaces. (d) Proportional product from Ontario ore smelted. (e) Recovery from concentrates shipped in 1919 and not previously reported.

Dividends and Bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies, or a total of $114,334,884.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

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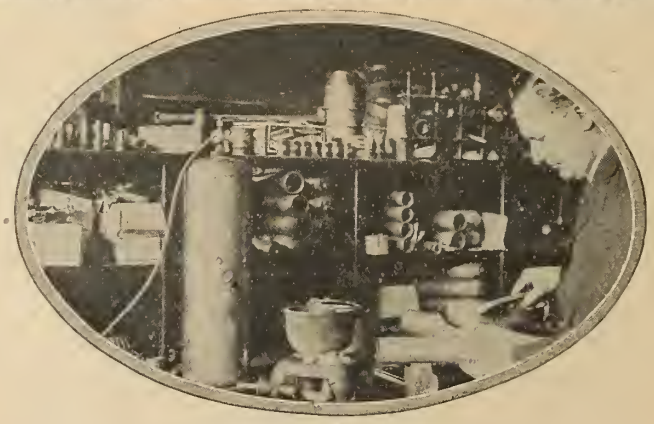

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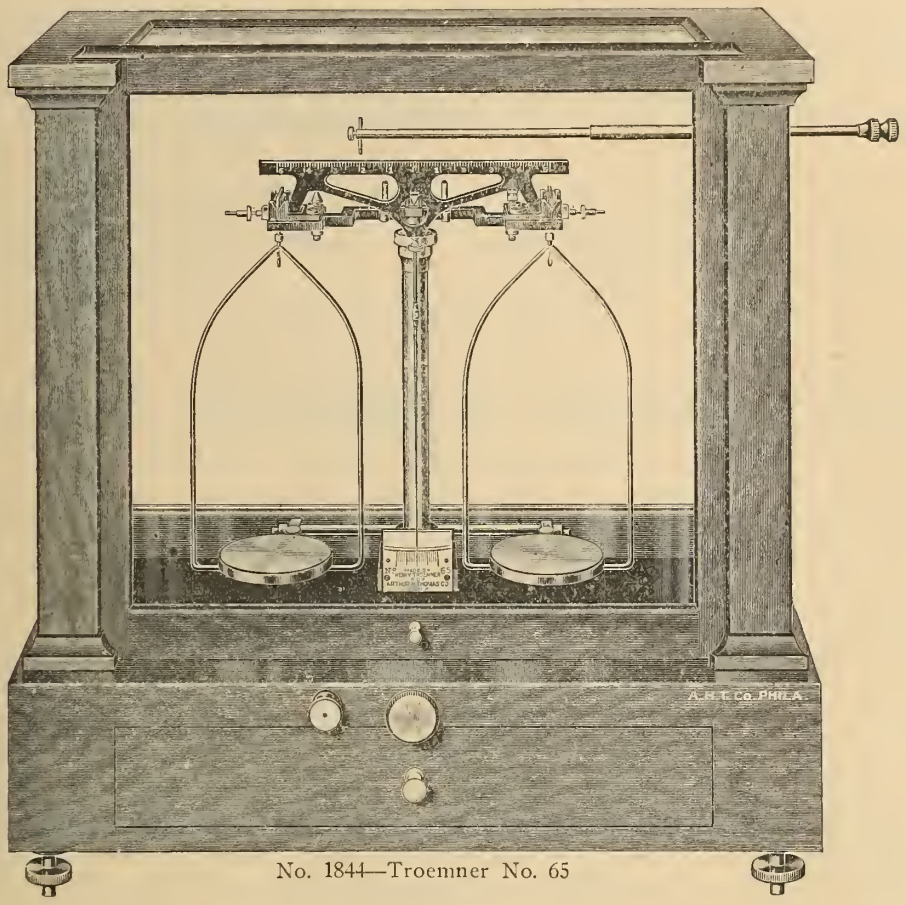

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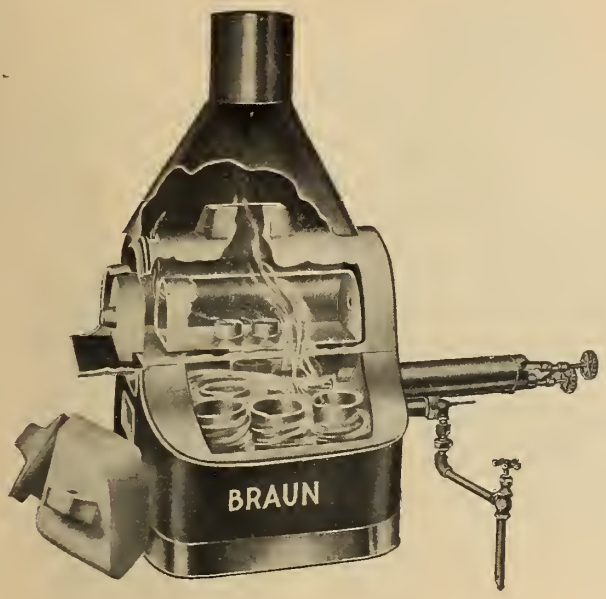

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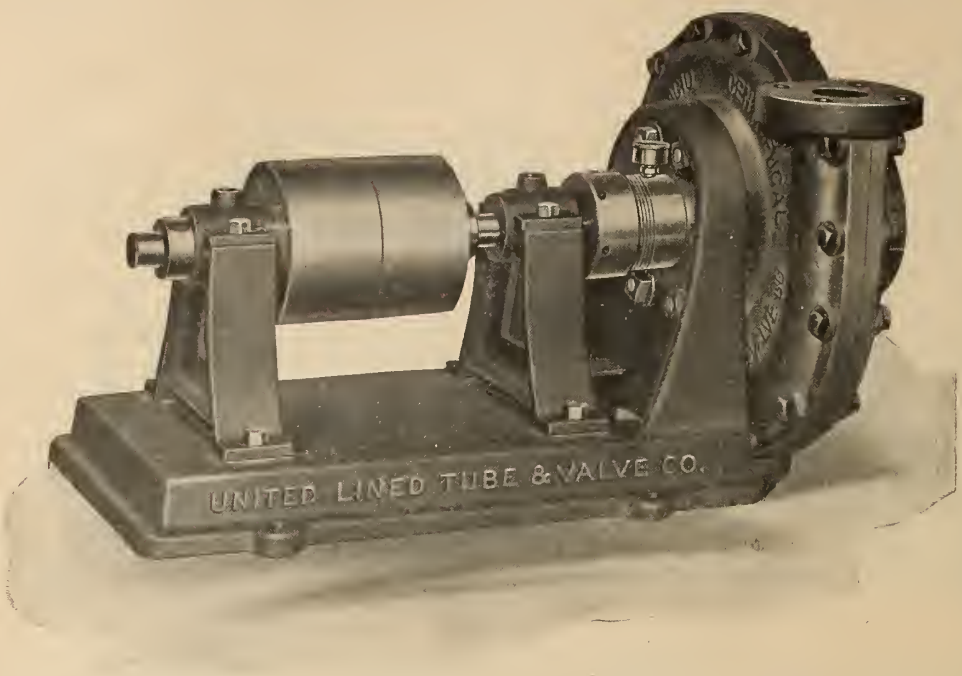

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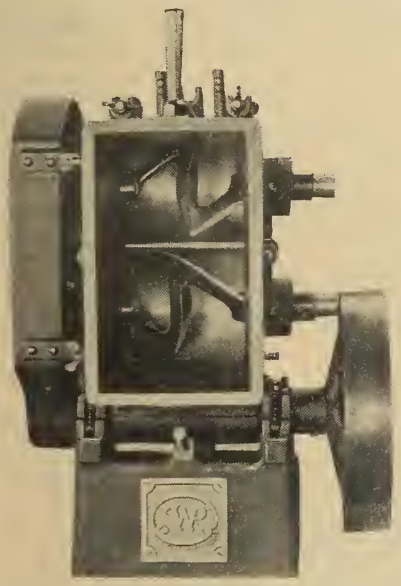

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Vol. 7 No. 8 **TORONTO, AUGUST, 1923** **$3.00 a Year; 40c a Copy**

P. F. McCLEARY, Associate Editor. **T. LINSEY CROSSLEY, Editor.** **L. E. WESTMAN, Business Manager.**

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CONTENTS—Issue No. 39—Issued June 1st

Determination of Diastatic Strength; Malts and Malts Extracts, by Dr. C. A. Munsterman; Note on Precipitation of Copper, by A. W. Beshgetoor; Analysis of Refined Tin, by W. H. Jacobson; Notes on Carbon Determination by Combustion, by D. H. Strickland; Estimation of Sulphide and Thiosulphate When Present Together in Solution, by Jos. W. Coxe, Jr.; Note on Folding Filter Paper, by A. Regenbrecht.

EDITORIALS

A GROWING CHEMICAL SHOW

AGAIN the New York Chemical Show becomes the outstanding event in the chemical world for September.

For nine years, this Exposition has been demonstrating the progress of industrial chemistry in the United States.

It means something just a little different to all who attend. The student sees in action, or in real life, much that he has been told about in the class-room. He never dreamed there were so many catalogues to be carried away. The teacher sharpens his experience, and brings away some new ideas. The salesman meets old friends, and makes new ones, and the chemical engineer or chemist casts a very intelligent eye over machinery or apparatus on display, for something that will give him help just where he needs it, back in his plant.

And, binding together all these things, is a series of conferences, addresses, motion-picture demonstrations, and papers, that are distinctly educational in value, and make fine material with which to demonstrate the essential place of chemistry in industry to a public not as yet over-sold on the subject. The exposition is a very practical post-graduate course for anyone.

DEVELOPING OUR PAPER INDUSTRY

INTERNATIONAL industrial bargaining has become the very breath of high politics. Just now, a very plain situation is being twisted and turned by all parties concerned. Canada happens to have a few remaining trees, from which newsprint can be made. Now it would be desirable, from the standpoint of the owner of a mill in the United States, to bring the wood to his factory, rather than move his plant to the wood supply. Canada would like to secure that mill, and, being in possession of the wood, has rather an advantage. The matter may not be quite so simple as this, but it is of this order. It is true that other countries have a little wood of their own, but, even granting this, it seems beyond much doubt that the best interests of this country rest in holding out on the point that paper is the thing to export.

Politicians may express the hope that somehow everyone is going to be satisfied. Large interests may try to frighten their governments and influence public opinion by announcing calamities that will occur to those who cross their path. Small farmers may urge a wider market for their contributions. None of these things alters one iota the demand or the supply.

Our suggestion to provincial and Dominion governments is to arrange things so that we can remain in possession of as much pulpwood as we can save from burning up, and take the very reasonable chance that, if we insist even a little bit, there need be very little wood leave Canada, before it passes over a roll.

THE ROMANCE OF THE METALS

HISTORY has been fairly generous to the metals. They have been the friendly aids of man for such vast periods that some of our earliest records are concerned with their uses and preparation.

As a stimulus to exploration and colonization, they have been large factors in the chase of European and Mediterranean nations over the whole globe. About all this, a wonderful series of romances could be written. There are metals that lure man on. He can never discover enough to satisfy himself. We are still chasing gold and platinum, without any apparent catching up. Our appetite for silver may at times become fairly well satisfied. Silver has suffered a decline since 1500 B.C., when it was more to be desired than gold. The metal mercury has caused possibly more investigations of a type than any other. It remained a wonderful mystery for thousands of years and was the basis of much alchemistic speculation.

The history of the largely used metals has been much the same. Discovery has been followed by long periods of slow development. At times, it appeared as if a given metal was doomed to play a minor part forever. But, almost always, its place is found. Aluminium has a history and a brilliant future. Even platinum was a "nuisance," when the Spaniards first found it mixed with gold in the West Indies. Tungsten was in the same state twenty-five years ago. Nickel was a great drawback to the production of copper from Sudbury ores, until it was realized that nature had given to Canada a wonderful and unique source of riches. Magnesium, cadmium, bismuth, tellurium, are still to find their place in a big way. Cobalt has branched out since its discovery. Elwood Haynes took the matter in hand, and now cobalt is well beyond any possibility that it will ever be allowed to go back to its former state of idleness. In fact, it is a habit among metals to remain necessities once their place is found.

It is hard to conceive of a world where iron was a rare metal, and yet man had advanced to a relatively complicated civilization before iron was

known. Egypt never really knew iron, and it was still rare during her most famous periods.

For readers who are metallurgists or chemists, it is not necessary to review well-known facts regarding the technical history of the development of individual metals. But, at times they should realize in a broad way the wonderful progress that has been made, so that new visions, dreams if you like, may be created. From such fountains of inspiration may be secured a further stimulation to more concentrated applications of research, that will find some useful work in a larger way, not only for those now in idleness, but also for those that have attained a large place among the necessities of industry.

STEEL AND COAL STRIKES

STRIKES with damage to company property, again present a sorry spectacle in Nova Scotia. It is useless, at the moment, when feeling runs high, to argue about what should have been done years ago, and what should never have been allowed to take place. Although the situation has been cleared up, it cannot be regarded as permanently settled.

It has never been an easy task to operate the coal mines of Cape Breton, or the steel mills of Sydney, at any great profit. This has been made more difficult by continuous labor trouble. Everybody concerned has a perfectly good case, including the public, and the industries using Nova Scotia coal and steel. In the final analysis, the case of the public is the more important.

Anyone familiar with conditions in the district concerned will realize how easy it is for leaders with unsafe plans of action to impose these upon the workmen. There are few things around Glace Bay conducive to anything but life in the very raw. This is certainly true, as viewed from the standpoint of the average miner. No one may be at fault. Probably the easiest thing to blame is the climate. But, until the fundamental question of better living conditions is solved in the district, we hesitate to think that anything but trouble will be continuous. It may be pointed out that conditions have improved. The companies concerned have recognized this problem for years, but are so situated that they cannot possibly create a model city and still sell coal and steel at competitive prices.

If the district were close to specialized industries consuming its products, it would be another affair. If secondary industries could be attracted to the district, the mining population would be tuned up accordingly. The problem of Cape Breton is the general problem of our eastern provinces, and perhaps, in turn, the outstanding handicap of the whole Dominion, namely a lack of any sort of home market commensurate with the capacity of our resources, and a very long haul to larger and frequently well-protected markets.

ELECTRICAL EFFECT ON MOLECULAR STRUCTURE IN METALS

MOLECULAR structures of molten metals as affected by electric currents is a subject to which we direct the attention of those of our readers who are interested in electro-metallurgical work.

Metals produced in the electric furnace have been for different reasons considered to have some properties superior to those produced by other methods.

Research and discussion in this direction suggests that we shall find results which will enable us to control and improve a metal for more pronounced mechanical effects, due to a knowledge of the electrical and magnetic phenomena.

The nature of this control is based on the assumption that molecular structure and crystal growth is a bonding due to electro-magnetic values. The regulation of the electrical current used being an easy matter, it appears that radical improvements in electric-furnace metals may be expected from the development of molecular electrical effects in the molten state, since the physical properties of a metal are due to a great extent to the crystal orientation in the solid.

Control of crystal growth by an electrical process is an important advance and we hope to be able to report the results of further investigations along this line.

SCIENCE AT THE CANADIAN NATIONAL EXHIBITION

SCIENCE, and particularly the medical sciences, have a most remarkable appeal to all. Human life is beyond price, and he who solves mysteries in this field secures, without his volition, the attention of the world.

The decree to which this is recognized in Canada to-day is a thing to wonder at, when our times are compared with those of a few years ago. Who would have advanced the theory that a young medical doctor, just entering his life-work, would be able to accomplish anything, no matter how worthy or important, that would have led the authorities of the Canadian National Exhibition to invite him to open, in an official manner, the greatest annual Exhibition in the world, and name the occasion "Science Day?"

All professional men of science, engineers and chemists, should ponder well the significance of such events. Here is quick, specific, full and democratic recognition of a scientific achievement.

If Science prospered under less appreciative conditions, what may we expect when the highest honors are rendered promptly? In our youthful freedom as a country, we are not bound to tradition, and in this event, along with the recognition so readily given by the Dominion Government, a popular precedent has been established.

Such recognition will aid the cause of scientists in general. Outstanding work in fields other than medical or biochemical will more easily receive public attention, because of it; and it is in this spirit, the cause of the public recognition of science in general, that Dr. F. G. Banting has consented to play the leading role on Science Day at the Canadian National this year.

THE COLLEGE MAN'S RESPONSIBILITY

PROFESSIONS, to which it has been assumed in the past, that college men would direct their steps, are becoming somewhat crowded. They carry with them some social status and a certain sense of independence, but they seldom offer much more to an ambitious young man than a competency.

This is coming to be realized and will be increasingly as the universities continue to turn out men to face the world. Men and women with college training are seeking places in the industries.

Upon these rests something of the responsibility of progress in industry. There are several things that might be touched upon as either retarding or advancing the cordiality of their reception in the ranks of producers and their contribution to conservation of materials and human endeavor.

Perhaps it is more important than anything else that the college man should realize that he is a beginner, that the humblest worker knows the ropes better than he. Any assumption of superior knowledge will certainly produce a succession of "bum steers" and loss of prestige for "theory" as being something opposed to "practice." There should never be any pooh-poohing of the theories of the practical man, and incidentally the more a man emphasizes the fact that he is a "practical" man, the more likely he is to have strange theories. These must be listened to and discussed because they are nearly always based on observations from which wrong deductions were taken, and which often afford information of value.

Many matters which should be brought to the attention of the chemist or engineer are left for him to discover himself, after leaks and losses have been running long enough to begin their appearance on the costs. Often these could have been stopped immediately, if the man who noted them first had the right attitude.

Then it is not advisable always for the college man to go into industry as a technical man. To a great many, the road to success can best and most rapidly be travelled in overalls. A man with a trained mind, operating units of mill machinery has a far better chance of mastering many of the problems of industry than if he had to depend on reports of untrained observers.

The social and ethical problems of industry, may be to some extent solved or modified by the presence of scientific men in the operative ranks.

SPEAKER AT MEETING OF PAPER TECHNICIANS

"For many years the supply of raw materials for paper making was limited, but since the scientist has put his brains into the matter, we can now produce vast quantities from wood."

CHEMICAL MOVIES

Demonstrations in junior chemistry may have cause to bless the moving pictures. We saw some that had quite a thrill for us. They came after one of those "Go Getter" pictures in a little town whence the next train departed at 3 a.m.

The first one was a "Fireless Cooker." It consisted of quick lime "en casserole" treated with water, upon which when the re-action started, an egg was deftly broken and promptly cooked. We didn't notice anyone eating it, though it looked fairly well done.

A very effective picture was produced by the addition of sulphuric acid to a neatly mixed little heap of potassium permanganate and sugar. The incipient action and consummation were quite striking.

Think how pleasant a sensation it would be for the lecturer, with a good reel of film, to be able to say "You will note, gentlemen——" and be quite sure they would note.

Correspondence

A TOO INCLUSIVE NAME

To The Editor,
CANADIAN CHEMISTRY AND METALLURGY.
Dear Sir:—

The July number of your Journal contains a report of the formation of an organization entitled "The Canadian Association of Official Analysts." According to the personnel of the members of the association and the field of analytical chemistry covered by the organization, their self-styled title appears to be rather too officious. Had this new organization confined themselves to the term the "Canadian Association of Official Agricultural Chemists," there could have been no objection taken, but the more general designation of "official analysts" is decidedly misleading. There is a distinct difference between official agricultural chemists and official analysts, and I cannot but think that this new organization has bestowed upon themselves a title which gives an entirely erroneous impression as to the scope of their official powers.

In the interests of analytical chemistry in Canada, I do not think that such an association should exercise a prerogative beyond that of the field covered by the Fertilizer and Feeding Stuffs Act, in the interests of the application of which the Association had its inception.

Yours very truly,
J. W. SHIPLEY,
Asst. Professor of Chemistry.

University of Manitoba,
Winnipeg, Man.,
July 31st, 1923.

A Simple, Rapid and Economical Method of Separating Nickel and Copper from Iron

By E. G. R. ARDAGH AND G. M. BROUGHALL

Department of Chemical Engineering, Faculty of Applied Science, University of Toronto.

FOR separating nickel from iron in ores such as those mined in the Sudbury, Ontario, district numerous methods have been recommended. Of these the best known are the following:

(1) The Ammonium Carbonate Method.[1]
(2) The Basic Acetate Method.[15]
(3) The Phosphate Method.[3]
(4) The Ether Method.[5]
(5) The Lead Oxide Method.[6]
(6) The Succinate Method.[11]
(7) The Dimethylglyoxime Method, using a citrate or tartrate solution.[17]

Objections can be raised to every one of these methods. For example: (1) is long and tedious, and furthermore does not give a complete separation,[2] (2) requires too great dilution; the precipitate is difficult to wash and often retains Ni,[3] (3) requires a double precipitation,[4] (4) is inconvenient, tedious and in addition requires special apparatus, (5) does not give complete separation.[4]

One can scarcely imagine a simpler and more convenient way of separating Cu and Ni from Fe than the old ammonia + ammonium chloride method used in qualitative analysis. If this method can be modified so that Ni (and Cu also) can be completely separated from Fe by one precipitation without at the same time requiring abnormal quantities of ammonia and ammonium chloride or sulphate, the time consumed on much routine work, as well as the cost of chemicals required for the same, will be materially reduced. In their efforts to this end the authors have been completely successful.

Separation of Nickel From Iron

Standard Solutions Containing Nickel and Iron

37.0 grams of Ni $(NH_4)_2(SO_4)_2 .6H_2O$ were dissolved and made up to two litres. Determination of the Ni in this solution by dimethylglyoxime gave (1) 0.0258 and (2) 0.0260 grams Ni in 10 cc. Electrolytic deposition gave (1) 0.0258 and (2) 0.0259 grams. Mean value 0.0259 grams Ni in 10 cc.

Enough $Fe_2(SO_4)_3$ was dissolved in two litres of warm water slightly acidified with H_2SO_4, to give a solution containing very close to 0.1 gram Fe in 10 cc.

Determination of Nickel Separated from the Iron

To determine the Ni in the experiments that follow, the cyanide method was selected because of its rapidity. 10 cc. of the Ni solution were diluted to 150 cc., 5 drops of conc. NH_4OH added and then 5 cc. of 0.1% $AgNO_3$ and 5 cc. of 2% KI. The NaCN solution (50 grams diluted to 2700 cc.) was run in with constant stirring until the AgI opalescence cleared. Titration was carried out at room temperature. The blank for the opalescence alone was 0.2 cc. NaCN.

10 cc. Ni solution (0.0259 grams Ni) required 5.2 cc. NaCN net.

To determine the effect of excess NH_4OH, the following titrations were carried out with 10 cc. Ni solution diluted to 200 cc.:

Cc. Ni Solution Used	Cc. NH_4OH (d. 0.90) Added	Cc. NaCN Required
10	0.1	5.4
10	1.0	5.4
10	3.0	5.4
10	5.0	5.4
10	6.5	5.3
10	10.0	3.0

It is evident that as much as 5 cc. of conc. NH_4OH may be present in 200 cc. without affecting the titration.

Influence of Varying Concentrations of NH_4OH and NH_4Cl or $(NH_4)_2SO_4$, Working with a 200 cc. Solution.

Ibbotson[9] and Brearley have shown that a precipitate of $Fe(OH)_3$ will adsorb Ni just as readily if the Ni solution is added after the $Fe(OH)_3$ has been thrown down as when the Ni is present in solution during the actual precipitation of the iron. In the same article it is shown that if very large quantities of NH_4Cl (100 grams) and of conc. NH_4OH (50 cc. in excess) are added, a very complete separation can be obtained. Such extravagant quantities of these reagents are, of course, out of the question for routine work.

Series A

The use of Ammonium Sulphate and Ordinary Reagent Ammonia (1 conc. NH_4OH to 1.5 H_2O)

In this series 10 cc. of Ni solution and 10 cc. Fe solution were taken, diluted to 200 cc. and heated before precipitation. The precipitated Fe $(OH)_3$ was washed with water.

	Grams $(NH_4)_2SO_4$ Added	Cc. Reagent NH_4OH Present in Excess	Ni in Filtrate in Terms of % of Amount Added
(1)	none	Just enough to give faint smell	2
(2)	5	5	59
(3)	5	5	(a) 49 (b) 51
(4)	10	5	71
(5)	15	5	73
(6)	20	5	84.5
(7)	25	5	83
(8)	none	5	11.5

(2) NH_4OH added before the $(NH_4)_2SO_4$. In all the other trials the $(NH_4)_2SO_4$ was added first.

It can be seen that very large quantities of $(NH_4)_2SO_4$ and NH_4OH would be necessary to give complete separation.

Series B

The Use of Ammonium Sulphate and Conc. Ammonia (d. 0.90)

In this series the 200 cc. of solution were heated to boiling before the reagents were added, filtration was performed while the solution was hot, and the precipitate was washed with hot water.

	Grams $(NH_4)_2SO_4$ Added	Cc Conc. NH_4OH Added	Ni in Filtrate in Terms of % of Amount Added
(1)	5	10	75
(2)	10	10	81
(3)	15	10	84.5
(4)	15	10	86.5
(5)	5	25	92.5
(6)	10	25	92.5
(7)	15	25	92.5

(3) Stood over-night, was filtered cold and washed with cold water.

It is again clearly to be seen that very large quantities of the reagents must be present to bring about complete separation.

Series C

In this series the mixed Ni-Fe solution was evaporated to about 2 cc. and then NH_4Cl was stirred in and just sufficient water added to dissolve the NH_4Cl. The conc. NH_4OH was then added. The precipitate was washed three or four times with water.

One very noteworthy effect of this procedure proved to be the complete transformation of the usual bulky, flocculent $Fe(OH)_3.xH_2O$ precipitate to a dense form that takes up comparatively little space in the filter, and that can be washed quickly with gentle suction. Low[24] has also observed this phenomenon, and refers to it in his chapter on the determination of zinc.

	Grams NH_4Cl Added	Cc. Conc. NH_4OH Added	Ni in Filtrate in Terms of % of Amount Added
(1)	5	25	84.7
(2)	10	20	(a) 96 (b) 94.5
(3)	10	25	(a) 94.5 (b) 96
(4)	15	25	96

The $Fe(OH)_3$ precipitates from trials (3) and (4) were examined qualitatively with dimethylglyoxime. Ni was present in small amount.

This series shows that a somewhat better separation of Ni can be made by working with a small bulk of solution, but that the $Fe(OH)_3$ precipitate still retains a little Ni. The precipitates were easier to wash than those obtained in series A and B.

Series D

The procedure followed in this series was exactly the same as in Series C except that the precipitate of $Fe(OH)_3$ was washed with a solution containing NH_4Cl [or $(NH_4)_2SO_4$] and NH_4OH instead of with water.

	Grams NH_4Cl Added	Cc. Conc. NH_4OH Added	Grams Fe Taken	Grams Ni Taken	Ni in Filtrate in Terms of % of Ni Taken
(1)	10	20	0.1	0.0259	100
(2)	10	20	0.1	0.0259	100
(3)	10	20	0.5	0.0259	100
(4)	5	10	0.5	0.0518	100
(5)	5	10	0.5	0.0518	100
	Grams $(NH_4)_2SO_4$ Added				
(6)	10	20	0.5	0.0518	100

In each case the washed $Fe(OH)_3$ was dissolved in a little conc. HCl, conc. NH_4OH added in excess, the precipitate filtered and the filtrate tested for Ni with dimethylglyoxime. In trials (1) and (2) Ni could not be detected. In the remainder a trace only of Ni was found; in (4) about 0.1 Mg, in (5) much less than 0.05 mg. and in (6) about 0.05 mg. Ni.

The ore from the Creighton mine assays about 4.5% Ni and 45% Fe, hence in trials (4), (5) and (6) we used about the same quantity of Ni and Fe as a one gram sample would contain.

The wash solution, which was used cold, contained 10 grams NH_4Cl and 10 cc. conc. NH_4OH in 100 cc. In trial (6) 10 grams of $(NH_4)_2SO_4$ were used in place of the NH_4Cl.

The most satisfactory technique was found to be the following, when such a large quantity as 0.5 gram Fe was present.

To the Ni-Fe solution in a beaker or casserole add a few drops of conc. HCl and evaporate to about 5 cc. taking care to avoid local baking. Then take the vessel in the hand and swirl contents while continuing the evaporation over a small flame, until the volume is reduced to about 2 or 3 cc. While still warm add 5 grams NH_4Cl and work up the mass with a stirring rod. Add 10 cc. conc. NH_4OH, break up lumps, add about 25 cc. cold water and filter on a 7 cm. paper in an 8 cm. Buchner funnel. Wash back the bulk of the precipitate into the beaker or casserole, using the ammoniacal wash and transfer again to the filter. Wash six to eight times on the filter, consuming about 100 cc. of the ammoniacal wash-liquid in all. A powerful suction packs the precipitate on the paper too tightly and hence should be avoided. A suction equivalent to about three inches of mercury works very satisfactorily, and with it the whole operation of filtering and washing should not require more than about five minutes. When handling smaller quantities of Fe, say 0.1 to 0.2 gram, an ordinary funnel is quite satisfactory, but with larger quantities the precipitate packs in the apex of the paper.

SEPARATION OF COPPER FROM IRON BY AMMONIA AND AMMONIUM CHLORIDE OR SULPHATE

Fresenius (Quant. Chem. Analysis) states that to effect complete separation of Cu from Fe(ic) by NH_4OH, the precipitation must be repeated two or even three times. De Koninck, (*Qual. u. quant. chemische Analyse*, Vol. II., section 1050, p. 121) lays stress on the uselessness for practical purposes of attempting to obtain a complete separation by means of NH_4OH and NH_4 salts.

In the following series of experiments the Cu in the filtrate was determined by the Cyanide Method. This method is rapid, and though not very reliable, even when performed under the optimum conditions, it is nevertheless sufficiently accurate to serve as a guide, so that we could tell if our separations were improving or not as we changed the conditions of precipitation. We did not rely on our figures for Cu as we approached 100% separation, but examined the precipitate to determine whether or not it still retained any Cu.

The Cu solution contained 39.35 grams of $CuSO_4.5H_2O$ per litre. A few drops of H_2SO_4 were also added to prevent hydrolysis. 10 cc. of this solution, containing 0.1 gram Cu and 10 cc. of the Fe(ic) solution, containing 0.1 gram Fe, were used for each experiment. Only those conditions that gave the best results with Ni were considered worthy of trial.

Series A

The precipitation was carried out in a 20 cc. solution and the precipitate was washed three times with water—

	Grams $(NH_4)_2SO_4$ Added	Cc. Conc. NH_4OH Added	Cu in Filtrate in Terms of % of Cu Added
(1)	10	20	(a) 95.5 (b) 96.5
(2)	15	20	(a) 96.5 (b) 96.5

In trial (2) the precipitate was washed six times.

The precipitates are dense and easy to wash, but evidently water alone does not remove the last traces of Cu.

Series B

The method was identical with Series A, but the precipitate was washed with a solution containing 10 grams of $(NH_4)_2SO_4$ and 10 cc. conc. NH_4OH in 100 cc.

	Grams $(NH_4)_2SO_4$	Cc. Conc. NH_4OH	Cu in Filtrate in Terms of % of Cu Added
(1)	10	20	(a) 99.5 (b) 100
(2)	10	20	100
(3)	10	20	98.5
(4)	10	20	100
(5)	10 grams NH_4Cl	20	100
(6)	10 grams NH_4Cl	20	100

(1) was washed three times. The precipitate when tested for Cu with $K_4Fe(CH)_6$ was found to contain about 1 mg.

(2) was washed six times. No Cu in the $Fe(OH)_3$ precipitate.

(3) used 40 cc. Fe(ic) solution in place of 10 cc. Evaporated to about 3 cc. before adding $(NH_4)_2SO_4$ and NH_4OH.

Washed three times. The precipitate contained about 1.5 mg. Cu.

(4) Same as (3), but washed six times. No Cu in the $Fe(OH)_3$ precipitate.

(5) and (6) same as (2), but NH_4Cl used in precipitating and washing in place of $(NH_4)_2SO_4$.

Evidently 0.1 g. Cu can be completely separated from 0.4 g. of Fe by this method. This is approximately as much Fe as a 1 gram sample of Creighton ore or a 2 gram sample of Crean Hill ore would contain.

Application of the Method to Crean Hill Ore and Creighton Ore

The two samples of ore were ground to such fineness that approximately 90% of each would pass an 80 mesh screen. The ores on analysis gave the following figures:

Crean Hill ore....Ni 1.59% Cu 3.30% Fe 21.72% S 11.88%
Creighton ore....Ni 4.41% Cu 1.62% Fe 43.50% S 27.37%

One gram of the ore was evaporated to dryness with 10 cc. conc. HCl and 5 cc. conc. HNO_3. After addition of 10 cc. conc. HCl to the residue it was evaporated to about 3 cc. 10 grams NH_4Cl and 20 cc. conc. NH_4OH were now added, the precipitate filtered off and washed three times with wash solution containing 10 grams NH_4Cl and 10 cc. conc. NH_4OH in 100 cc.

The $Fe(OH)_3$ precipitate on examination was found to contain 1.5 mg. of Cu, but to be free from Ni. Repeating the experiment we found the $Fe(OH)_3$ to contain 1.0 mg. Cu, but to be free from Ni. Repeating the experiment a third time, in which we washed the $Fe(OH)_3$ six times with the special solution, we found only 0.1 mg. Cu in the precipitate.

The Creighton ore was treated in exactly the same way.

The $Fe(OH)_3$ precipitate which had been washed four times was found to be free from both Ni and Cu. Repetition of the experiment gave the same result.

The siliceous residues from both ores were tested for Ni and Cu, and in each case both metals were absent.

Determination of the Ni and Cu in the filtrates from the $Fe(OH)_3$+gangue in the above samples was carried out by precipitating the Cu as CuS and then determining the Cu and Ni by titration with standard NaCN. This method is, of course, not to be recommended for precise work, especially for Cu, but it served as a means of confirming our qualitative tests already given.

Crean Hill sample	(1)	Ni 1.61%	Cu 3.10%
	(2)	Ni 1.58%	Cu 3.10%
Creighton sample	(1)	Ni 4.39%	Cu 1.59%
	(2)	Ni 4.35%	Cu 1.71%

We are of the opinion that excellent separations can be made with much smaller amounts of NH_4Cl [or $(NH_4)_2SO_4$] and NH_4OH than those employed in the foregoing experiments. We did not, however, attempt to determine the minimum quantities it is possible to use successfully, but have left that for others to work out.

Summary

(1) A simple, rapid and inexpensive method for separating nickel and copper from iron has been worked out.

(2) The method has been shown to give excellent results on typical nickel ores from the Sudbury District.

(3) A method by which ferric hydroxide can be precipitated in a dense form, easy to filter and wash, has been indicated.

References

The following list of references is intended principally to serve as a guide to the history of the methods suggested for separating Ni and Cu from Fe. There are also included some of the original articles on the determination and detection of Ni and Cu, and two or three standard works that contain useful information on this subject.

I. Methods of separating nickel from iron.
1. Schwarzenberg—Liebig's Annalen 97 (1856), p. 216.
2. Laby—Chem. News 89 (1904), p. 280.
3. Cheney and Richards—Chem. News 36 (1877), p. 161.
4. Moore—Chem. News 54 (1886), p. 300.
5. Rothe—Chem. News 66 (1892), p. 182.
6. Field—Chem. News 1 (1859), p. 4.
7. Thomas—Chem. News 35 (1877), p. 187.
8. Hassreidter—Z. angew Chem. 22 (1909), p. 1492.
9. Ibbotson & Brearley—Chem. News 81 (1900), p. 193.
10. Thompson—J. Ind. Eng. Chem. 3 (1911), p. 950.
11. Fresenius—Quant. Chem. Analysis.
12. Mellor—Quant. Inorg. Analysis.

II. Methods of separating copper from iron.
13. Rose—Poggendorff's Annalen 110 (1860), p. 424.
14. Fresenius—Quant. Chem. Analysis.

III. Determination of Nickel.
15. Gibbs—Z. anal. Chem. 3 (1864), p. 336. (Earliest description of electrolytic method)
16. Campbell and Andrews—J. Am. Chem. Soc. 17 (1895), p. 127. (Earliest description of cyanide method.)
17. Brunck—Z. angew. Chem. 20 (1907), p. 1844. (Earliest description of quant. detn. by dimethylglyoxime.)

IV. Determination of Copper.
18. Parkes—Mining Journal, 1851. (Earliest description of cyanide method.)
19. Steinbeck—Z. anal. Chem. 8 (1869), p. 12. (Cyanide.)
20. Dulin—J. Am. Chem. Soc. 17 (1895), p. 346. (Cyanide.)
21. Gibbs—Z. anal. Chem. 3 (1864), p. 334. (Earliest description of electrolytic method.)
22. Low—Technical Methods of Ore Analysis.

GERMAN DEVELOPMENT OF ALUMINUM WORKS

The following products are being manufactured successfully at one of the most modern and best-equipped German plants, namely the United Aluminum Works, situated at the southern limit of the Senftenberger coal fields:

1. Aluminium to a purity of 98.5% in any desired form.
2. Corundum, abrasives.
3. Soda crystals.
4. Mineral colors; iron oxide pigments for use with lime, glue, oil and varnish.
5. Water-free coal tar, with high paraffin content.
6. Hydrated iron oxide, as material for gas purification.
7. Sand-lime brick—120,000 bricks daily.

Of these products the iron oxide pigment is now put on the market, under the protected name "Veralufarbe." The iron oxide is precipitated on treatment of the bauxite with alkali, is washed, dried and undergoes several purifications, until, at last, a pigment of impalpable fineness is obtained.

The pigment almost equals that of natural ochre, and undoubtedly far surpasses other artificial iron oxide pigments. Its appearance is a uniform, beautiful, reddish brown color, which mixes easily with paints and oils.

The chemical analysis of "Veralufarbe" is:

Loss on ignition	15.75%
Silica	2.73
Alumina—Al_2O_3	40.58
Fl_2O_3	20.77
Ca O	13.50
Mg O	0.45
SO_3	0.11
Na_2O	3.15

As might be expected from the high alumina content, paints made from this pigment are very resistent to weather A number of iron freight-cars, which were painted with "Veralufarbe" oil a year ago to-day show a perfect surface.

On account of its alkaline content, in the form of free soda, it is naturally to be expected that a paint of this pigment would prevent rusting of iron; and tests are being made along this line.

The plant is able to produce fifteen tons of "Veralufarbe" per day.

A Research in Connection with the Textile Industry
The Theory of Dyeing

By ALFRED BURTON

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TEXTILE Chemistry is a branch of science that our universities in Canada have not as yet taken serious hold of. We none of us doubt but that our industrial progress will depend upon the alliance of science to industry and upon the co-operation of the different branches of science with each other, this can only be attained by the cultivation in the first place of pure science. Following this comes a knowledge of the technique of the industry and the application of the knowledge acquired to the great purposes of industrial development; for there is no other way of advancing the standard of goods produced than by research, and research is not much good unless it is proposed to find the means of carrying discoveries into effect.

The success that has attended the manufacture of dyestuffs is very largely the result of the application of pure science and chemistry and painstaking research into certain branches of organic chemistry, which has enabled the vast variety of artificial coloring matters, now found upon the market, to be produced.

One discovery has led up to another providing the chemist with theoretical data enabling him to obtain further rewards from his researches by the discovery of even better methods, and colors meeting more exacting requirements.

While chemists have been engrossed in the theory of color making, comparatively little attention has been directed to chemical theory of dye-using and the chemistry of dyeing.

The theory of dyeing seems to have been regarded as of academic interest only and has not been recognized as having a bearing upon the final results obtained on textiles. The importance of the interaction between the fibre and the dye, whatsoever it may be, is a matter deserving scientific research and should reward the investigator in this field.

Our Present Knowledge

So far as the question has been studied, two theories relating to dyeing have developed, the mechanical and chemical. Apostles of one theory seem deeply concerned in showing that the disciples of the other theory are wrong.

A preconceived idea that the interaction between fibre and dye is physical or chemical will preclude the researcher from finding out the truth about the matter. It is not only in dyeing processes that there is doubt, whether a given action may be one or other or both of these artificial classifications of energy. There are grounds for considering certain of the dyeing effects as chemical and certain others as physical. The researches into chromophores and chromogens have been taken with a view to dyestuff manufacture, although they may later have some effect on the chemistry of dyeing. There is much to be done in this direction for there are bodies such as mono-nitro-phenol which require extensive substitution to produce chromophores.

An example of theorizing in this direction may be seen in Georgievic's "Chemistry of Dyestuffs," in which it states: "a chromophorous group will produce the expected coloration effect, the more readily in proportion as the atomic complex into which it is introduced is richer in carbon." The language of the alchemist to date!

Fibres dye differently in their natural condition than when they are pounded and ground up. This fact is well known to dyers of paper pulp, and is due probably to the destruction of the cellular nature of the fibre, whereby osmosis is made impossible. The beater does not affect the chemical nature of the raw material. The same dye gives shades fast to washing on one material and not on another and may be due to difference in chemical affinity between dye and fibre or to differences in the osmotic reactions between the fibre and the dye solution. Again, some dyes are substantive on one fibre but not on another and require a mordant. If a mordant is used the fixation of the dye is doubtless mostly chemical, as the lake is an insoluble compound produced by chemical reaction between the color base and the mordant, nevertheless, the fastness of the color may depend upon penetration, i.e., osmosis, as well as upon the stability of the lake. In the case of indigo the conversion of the leuco-compound into indigo-blue is the effect of the chemical action of atmospheric oxygen. Animal fibres seem to act as bases to sulpho-azo-dyes while wool and silk are both dyed red by the colorless base rosaniline, which has no effect upon vegetable fibres except in the presence of acid.

Specific Problems

Mercerization presents another problem, the exact chemical change, if any, is as yet undetermined but two things are known, first that the physical character of the fibre is changed and that it dyes a deeper shade with the same amount of dye and retains the color more permanently than before mercerization.

The actions involved in the dyeing of a textile in the condition in which spinners, weavers and dyers have to deal with it, i.e. in the form of fibre, are of a complicated nature.

The scientific investigation of dyeing reactions has been comparatively neglected and it offers a field in which there is a rich harvest to be reaped. The scientific side must come first and the whole of the methods as yet employed in the investigation must be thoroughly revised. The investigators will find plenty of hard work, and anyone who takes up this branch of science will be of more help to his successors than his predecessors can be of help to him, owing to the comparative neglect of investigation, the indefinite nature of our present knowledge, and the absence of reliable information on this subject. This is a case where it may be said that the art is in advance of the science.

In the borderland between pure chemistry and chemical industry lies the need to prosecute research for the direct betterment of industry, and industry depends to-day and will in the future depend more and more upon the pooling of scientific knowledge won at our universities and the technical ability which can only be acquired from large scale production.

A Tribute to University Research

To-day it is evident science is being crippled for want of funds and whilst our governments are constrained to exercise the utmost economy, our universities have fairly well grasped the situation providing as liberally as possible for the carrying on of pure chemical research in spite of the need of fostering their resources. The research council has also done its bit with the monies at its disposal for which it should receive full acknowledgment, whilst industry has been too slow in the past to help our experimental workers in science. We are ever ready to proclaim the urgent necessity for more generous state recognition of science, but God helps those who help themselves, and if we continue to neglect this axiom we must expect to see other countries reaping our rewards.

The Wine Industry in Canada

Review of Developments---Recent Progress Due to Introduction of Scientific Principles

By H. B. MEYER
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THE present status of the wine industry in Canada may be better appreciated by reference to a brief historical sketch of the introduction of the grape into this country, and the subsequent development of vineyards and wineries.

The grape is one of the oldest and most popular of fruits, its culture dating back to prehistoric times. Seeds have been found in the remains of the Swiss lake dwellings, of the bronze period, and entombed with the mummies of Egypt. In later periods, it was cultivated by the Greeks and Romans. South-western Europe has boasted extensive vineyards for centuries.

In due course, the grape made its appearance in North-eastern United States and California, and the Canadian vineyards have been stocked for the most part from these American vines.

The grape centre of Canada is located in the Niagara Peninsula, one of the most famous fruit districts in the world. The first record of planting that has been brought to the attention of the writer is that of the small area set out on the farm now owned by Mr. Porter Adams, at Queenston, in the township of Niagara, in the year 1857. About the same time, vines were set out on Pelee Island, in Lake Erie. Vines were planted throughout the district in ensuing years, until, in 1880, there were some 400 acres of commercial grapes.

The industry seems to have received no special stimulus, until about 1882, when a highly advertised new variety was introduced. 1890 found some 2,400 acres under cultivation. By 1901, this area had increased to 5,700 acres and the last census available credits Ontario with about 11,000 acres.

Grapes are grown on a great variety of soils, under varied conditions. The outstanding features in connection with their cultivation are their susceptibility to late Spring frosts, and non-maturity in the Fall, as well as attacks from insects and diseases. For these reasons, the grape centres are largely in those sections that are more or less protected from the greater extremes of temperature. Insect pests and diseases have been carefully studied, and, by keeping the vineyards clean, as well as a certain amount of spraying, their activities have been inhibited. In recent years, there has been practically no loss from these causes.

Various Uses of Grapes

Grapes are used for the manufacture of wines, grape juice, desserts, jellies, currants and raisins, and a considerable quantity finds its way to the fruit stands. In Europe, where the grape remains on the vine for a longer period than in Canada, it is much richer in sugar. Many of these sweeter varieties are made into currants and raisins, neither of which are manufactured in this country. For many years, the Canadian output was consumed by the householder as fresh fruit, jelly, or preserved product. Private individuals undertook the production of home-made wine, but not until comparatively recent times, was there any attempt to introduce a wine industry.

One of the first wineries was founded by Thaddius Smith, a Southerner, on Pelee Island in 1866. To-day neither the winery nor the vineyards which supplied the grapes are in existence. One or two of the older existing wineries have been established for some forty years, but at no time has the quality of their product warranted its general acceptance by the public, so that their production in the past has not been large, with almost negligible increase. The greater part of their output was consumed locally. The business, however, appears to have been profitable, and various wineries have sprung into existence in or near the grape centre, gradually increasing the manufacture of native wines.

Recent Growth

In the last few years, the industry has shown a remarkable growth. There are, to-day, some ten wineries, whose capital investment is from $100,000 to $200,000 each. Besides, there are about thirty smaller concerns. In 1922, ten of the leading manufacturers produced about 1,000,000 gallons of wine, while the remaining thirty made only about 58,000 gallons. The average sales generally amount to about one-third the season's output, the remaining two-thirds being kept on hand for maturing.

This year, the output will be at least double the previous year. The requirements of the Quebec Liquor Commission alone amount to one and a half million gallons. In Ontario, where the wine is sold directly to the consumer, a definite figure is not obtainable, but a similar quantity would be a conservative estimate.

The reason for this sudden growth is two-fold. Although legislation prevents the wineries from advertising their products, or soliciting business, the public are learning slowly, that there is a wine industry, and further, that they may purchase native wines under present legislation. At this time, however, the large majority are totally unaware of these facts. Another point which augurs well for the future of the industry, is this: Canadians have always been meagre consumers of wine, mainly for the reason that Canada has never produced any appreciable quantity of good wines. Native wines have always been considered inferior, and it has been a popular fallacy that the quality of the grape grown in this country does not warrant the production of a wine comparable with the imported product. This belief is entirely in error. Technical examinations of the Niagara grapes have revealed them to be a very high-grade material for wines. Grapes, no finer than our own, have led to a large and well established industry in both Australia and South Africa. In these countries of course, their respective governments have recognized the value of the industry and lent their support in stimulating its progress and establishing foreign markets. The export trade alone amounts to millions of dollars annually.

Chemists Making Progress Possible

Here in Canada, the manufacture of wine has languished both for lack of enterprise and appreciation. The last five years, however, have witnessed a new departure in the manufacture of Canadian wines. With an appreciation of the possibilities of producing high grade wines from Canadian grapes, and a keen sense of the responsibilities involved in perfecting such a process, some companies have enlisted the services of men whose practical experience and technical training have enabled them, by the application of scientific principles, to develop plants satisfying the best modern chemical engineering practice, and manufacture products which compare most favorably with anything imported.

It is true that owing to climatic conditions, the type of grape grown in Canada, is an entirely different stock from those found abroad. The character of a wine depends to a very large extent on the materials from which it is produced, but even a greater factor which influences the quality of a wine is the process of manufacture. The same grape will give rise to entirely different wines in different wineries.

In Canada, the process of manufacture in most wineries does not do justice to the grape. Practices which are glorifications

of antiquated home-made methods are still used as they were when the wineries first began. The results achieved by systematic and scientific processing, gratifying as they are to the producer, have been a revelation to the consumer, and this point is readily verified by the steady growth of companies operating under proper chemical control and guidance. One plant coming within the writer's personal experience has increased its output five times since 1919 and now has a capacity of 300,000 gallons.

Unfortunately Canadians have become so accustomed to associating high grade wines with foreign products that they are very sceptical about the virtues of a wine produced in their own country. Now for the first time they are learning otherwise, and when the general public finds that types of wine such as claret, burgundy, sauterne, tokay, champagne, port, etc., can be truly duplicated at home, the industry will assume the position it merits. There is no doubt that it has come to stay. Nearly 90% of the grapes grown are now ultimately converted into wine.

Grapes Easily Grown

The demand of the wineries for grapes has led to extensive planting of new vines. The statement that more grape vines have been set out in the St. Catherines district during the past year than in the past decade, is indicative of the fact that grape growers are planning for continually increasing business. The small amount of labor required for the proper maintenance of vineyards, in comparison to the average fruit orchard, is taken as one of the points in favor of the grape business at a time when labor is scarce and expensive. One man with a cultivator and a team can attend to twenty acres of grapes, excepting, of course, in the picking season, when extra help is required as with any fruit.

While admitting that the legislation may have encouraged the campaign of careful, technical control of the wine-making processes which have been largely responsible for the ready market which Ontario wines have found, the outlet thus created for Niagara grapes is one which cannot be stopped up by alterations in legislation. The handicap of the industry rests in the situation which restricts it from securing the appreciation of the public by ordinary means. For this reason it is difficult to influence the government or remove the legal restrictions which prevent much more rapid progress.

The initiative and skill of private individuals has created an industry in Ontario which produces products up to world standards. As yet but little general attention has been given to either scientific or industrial possibilities.

What the Dominion Department of Mines is Doing This Year

THE Department of Mines, Ottawa, has planned a very full program for 1923-24. The work is divided under the Geological Survey, the Mines Branch Laboratories and Experimental Plants and the Victoria Memorial Museum.

Field investigations of mineral resources include the collection of data respecting physical and chemical characteristics of mineral products, descriptions of methods of mining of mineral products, and treatment commonly employed. The department aims to supply those desiring to undertake development as a financial venture with specifications as to composition and character of products required to meet market conditions, the uses of products, the industries in which they are employed and essential commercial data respecting markets, prices and consumption.

Among matters under investigation at this time are:

The estimation of available sodium and magnesium salts in alkali lakes of western Canada. The paper industry uses large quantities of sodium sulphate and these deposits form a distinct asset particularly to mills situated in western and central Canada. Methods of purification and recovery are being studied. L. H. Cole, H. A. Leverin and Mr. F. Goudge are in charge of this work.

S. C. Ells will continue and complete his typographical survey of the bituminous sands of northern Alberta.

V. L. Eardley Wilmot is investigating the occurrence, character, methods of preparation for market and industrial uses of natural abrasive materials.

H. S. Spence is continuing his study of bentonite in Alberta and British Columbia.

A. W. G. Wilson will investigate the technology and recovery of arsenic and the production of arsenious oxide along with uses and markets in the United States and Canada.

A. Buisson and A. H. Robinson will investigate progress in the development of the mineral industry covering a variety of metals and products.

R. T. Elworthy is making a field study and chemical investigation of natural gas in Western Canada, determining in particular gasoline content. Recent drilling for oil has made available very large quantities of natural gas.

G. S. Parsons will visit gold milling plants in connection with laboratory investigations on gold ores.

J. H. H. Nichols is studying the coking properties of New Brunswick and Nova Scotia coals.

E. S. Malloch is studying present methods of utilizing and burning fuel both industrial and domestic.

Howells Frechette is making a general investigation of the brick industry in Ontario and Quebec conducting a special study of drying problems.

H. Gauthier is making a study of the endurance of recently built highways in Ontario and Quebec.

Ore Dressing and Metallurgical Division

In this Division under the direction of Mr. Timm, Messrs. C. S. Parsons and R. K. Carnochan, with the assistance of a staff of chemists are carrying on the following investigations on ore treatment.

Copper Ores—Experimental work on the concentration of (a) The lower grade copper ores of Hidden Creek, Anyox, B.C. Tonnage checks will be made to determine whether the results from the small scale laboratory work can be obtained on a larger scale; (b) The Flin-Flon disseminated ore of northwestern Manitoba; (c) The copper-gold pyrrhotite ores of Rossland, B.C., to improve efficiency of recovery of values; (d) Copper-gold ore from the Belmont Surf Inlet Mines, Surf Inlet, B.C.; and (e) The copper ore from the mines at Copper Mountain, Princeton, B.C.

Copper-Nickel Ores—(a) Small scale tests on the concentration of the lower grade copper-nickel ores of the Sudbury district will be supplemented by large scale tests.

(b) Further investigations on the determination of the precious metal values in the Sudbury ores; the Shebandowan copper-nickel pyrrhotite ores and other Canadian pyrrhotite ores and in the concentration and reduction products from these ores. This also is to confirm on a larger scale previous small scale tests.

Lead-Zinc-Silver Ores—(a) On the concentration of East Kootenay ores to determine the possibilities of improvement in concentration and the most suitable reagents to use in flotation; (b) An investigation of the carbonate ores to determine a process for treatment.

Gold Ores—(a) On the treatment of Kirkland Lake gold ores; investigation of difficulties of making high recovery; (b) A test on the concentration and treatment of samples

from the new gold fields in Rouyn Township, Quebec; (c) On the metallurgical treatment of typical Nova Scotia gold ores. It is believed that previous metallurgical practice did not result in a good recovery.

Iron Ores—An investigation has been begun on the leaching and electrolytic deposition of pyrrhotite ores and the roasting, leaching and electrolytic deposition of pyrite ores for the production of electrolytic iron and the recovery of the precious and non-ferrous metals that may be contained.

Molybdenite Ores—Tonnage tests will be made upon a shipment to be made from near Amos, Quebec.

Flotation Re-Agents—Considerable progress has been made in an investigation begun last year upon the use of various flotation re-agents in the concentration of mineral ores. The purpose is to stimulate the use of Canadian manufactured flotation re-agents.

Pyrites—Tonnage tests are being made on the concentration and separation of pyrites ores from the Eustis mine, Quebec.

Asbestos—Some preliminary work has already been done and it is proposed to continue an investigation of the wet separation of asbestos fibre from the rock.

Fluorite, Calcite and Barite—Small scale laboratory work on separation of fluorite, calcite and barite in the fluorspar from the Madoc district has developed a promising process for the separation of these minerals and it is proposed to conduct larger scale test work, to obtain further data and determine whether the process can be applied in practice.

DIVISION OF FUELS AND FUEL TESTING

Under the direction of Mr. B. F. Haanel, investigations are being carried on by E. S. Malloch, technical engineer; R. E. Gilmore, chief engineering chemist and staff of engineering chemists.

Lignite Coals—A continuation of work that has been in progress for a number of years including: (a) Small scale work to determine the feasibility of carbonizing the lower grade of Alberta coals; (b) Determination of the feasibility of briquetting the carbonized residue, obtained at different temperatures, from lignite coals.

Bituminous and Other Coals—(a) Relation of the coking properties of certain Alberta coals to their sparking qualities when burned in railway locomotives; (b) General classification of Canadian coals according to the area in which they are found and according to their general characteristics and chemical compositions; (c) Investigation of the physical properties of different Canadian fuels and their products.

A special investigation of New Brunswick and Nova Scotia coals with particular reference to their possible use in the production of a domestic, or house heating coke. This will include detailed chemical examination of the coals followed by large scale coking tests on selected coals and on mixtures of coals.

Peat—(a) Relation of degree of maceration to the drying and handling properties; (b) Effective heat pressure and reagent treatments on the structure and chemical composition of peat.

Oil Shales—Development of standard methods of examination; (b) Adaptability of oil shale for refining purposes and also as a motor fuel for internal combustion motor engines.

Crude Petroleum and Oil Products—(a) Canadian shale oil as a source of gasolene, illuminating, lubricating and fuel oils, etc.; (b) General examination of crude oils and crude asphaltic bitumen occurring in Canada.

Gasolene and Lubricating Oils—Survey of gasolenes and lubricating oils sold throughout Canada, for the purpose of deciding on the feasibility of establishing standard specifications for each, for use (1) by various government departments and (2) by the general public.

Other Motor Fuels—Adaptability of natural and synthetic motor fuels such as industrial alcohol, benzole, synthetic alcohol from a producer or natural gas for use in variable compression internal combustion engines.

Pulverized Fuel—The testing of pulverized peat, lignite, and other coals on a commercial scale to determine value for the generation of steam.

Domestic Heaters—Investigations are being continued having in view the determination of efficiencies of fuels and of factors and the suggestion of alternatives in design of heaters to permit the more efficient utilization of fuels other than anthracite.

Gas Making Coals—It is proposed to investigate the feasibility of utilizing Nova Scotia high sulphur coals for gas making.

DIVISION OF CERAMICS AND ROAD MATERIALS

Ceramics—Laboratory tests on clays, shales and other raw materials of the ceramic industries and on brick and other clay products will be conducted within the limitations fixed by available staff; studies will be made to determine the cause of faults in brick and tile of Canadian manufacture and to devise methods for overcoming them and investigation will be made of the drying properties of clays; experiments will be made on pottery bodies and glazes and on Canadian magnesite for refractory purposes.

POLISH GLASS INDUSTRY.

There are in Poland eighty-one glass works, of which 51 produce bottles, 17 sheet glass, and 12 plate-glass. In the Polish glass industry more than 12,000 workers are employed, and production is said to amount to 100,000 tons per annum; this figure is not official, and some doubt has been expressed as to its accuracy in view of the fact that glass factories are shut down for ten months of the year.

BISMUTH PRODUCTION IN RUSSIA.

The Russian Trade Delegation in Germany is conducting negotiations for the participation of foreign capital in the exploitation of the bismuth mines in the Trans-Baikal territory of Siberia. These bismuth depostis lie in the neighborhood of the mountain, Sherlova Gora, 70 kilometres from Chita. The deposits consist, according to geologists who have made investigations on the spot, of at least 1,500 tons.

CHEMICAL MARKET IN BRITISH MALAYA.

The value of drugs and chemicals imported into British Malaya increased from £243,904 in 1921 to £341,754 last year. Acetic acid, which is used for the coagulation of latex on the rubber estates, jumped in quantity from 48,660 gallons in 1921 to 387,594 gallons last year, and in value from £23,462 to £118,924.

LARGE JAPANESE FERTILIZER COMPANIES AMALGAMATE.

Arrangements have been made for the amalgamation of three of the largest Japanese fertilizer manufacturing concerns, viz.: The Japan Artificial Fertilizer Company (Dai Nihon Jinzo Hiryo Kabushiki Kaisha), the Eastern Acid and Alkali Company (Kanto Sanso K. K.), and the Japan Chemical Fertilizer Company (Nihon Kagaku Hiryo K. K.). On the completion of the scheme the two last-named companies will be dissolved, the Japan Artificial Fertilizer Company continuing, with modification of its capital. The amalgamation is to take effect from May 1st.

TASMANIA'S NEW TIN AREA.

Operations which have been in progress in the Mount Cameron district of Tasmania are stated to have proved the existence of an extensive and highly payable tin-bearing area.

The Uses of Carbon Dioxide---II.*

Uses in the Chemical Industries—Fire Extinction and Prevention—Medical and Miscellaneous uses.

By CHARLES L. JONES

Reseach Chemist, Compressed Gas Manufacturers Association

Uses in the Chemical Industries

Carbon dioxide finds application in many ways to chemical industry, but for the larger of the uses of this class resort is had to preparation of the gas as a part of the process, the application of liquefied carbon dioxide being confined in general to uses where the quantities consumed are relatively small. Among the processes in connection with which low-pressure carbon dioxide is ordinarily generated on the spot may be mentioned the Leblanc, Claus-Chance, and Solvay processes as classic examples. The precipitation of alkali metals in the sugar industry is a case in point. Solvent recovery systems have been devised which use a mixture of carbon dioxide and nitrogen as a vehicle[15]. A proposed method of manufacture of zinc oxide makes use of carbon dioxide as a diluent in order to facilitate the formation of finer particles.[16] It has been used as a neutralizing agent for excess alkali, as in glue manufacture, and for this purpose it would seem to have the advantage of being fool-proof, although not now generally used.

Carbon dioxide has been proposed as a vehicle for the gas distillation of coal tar[17], and petroleum,[18] and is in daily use in the distillation of more valuable organic chemicals. At one time it was used to prevent oxidation in the process of extracting logwood, and is said to increase the yield of usable extract obtained.[19] It has been applied as an antoxidant in various chemical operations with easily oxidized or flammable substances, as in the distillation of phosphorous compounds. As the anhydreide of carbonic acid, it finds application in the manufacture of carbonates, and for this purpose pharmaceutical manufacturers sometimes employ the liquefied gas. Used at one time for the precipitation of aluminum hydroxide in the purification of bauxite, its use in this connection is understood to be obsolete. Carbon dioxide obtained from fermentation of tanbark enters into the preparation of white lead by the Dutch process, but carbon dioxide from other sources is used in the Carter process, and it has been proposed to use low-pressure carbon dioxide from commercial liquefied carbon dioxide plants during the off-peak season for the preparation of wet-process white lead.

A small but consistent consumption of liquefied carbon dioxide is in the manufacture of salicylic acid. The synthetic manufacture of urea[20] affords interesting possibilities as a future outlet for the product of the carbon dioxide industry, since the seasonal nature of the present liquefied carbon dioxide business holds forth the possibility of low cost production of high-pressure carbon dioxide of high purity during the slack winter season for such a purpose.

Mechanical Uses

It is worthy of note that a cylinder of liquefied carbon dioxide is the cheapest available decentralized source of pressure over 500 pounds per square inch, and this has resulted in several applications of carbon dioxide as a convenient source of pressure. In the not too distant past it was used extensively for raising beer. Plumbers use it to blow obstructions from piping. It is used for testing various types of vessels for leakage; for example, it has been applied to the locating of holes in lead cable cover by observing the pressure drop along different sections of a cable, to one end of which a cylinder of carbon dioxide is attached.

Small cylinders of carbon dioxide of convenient size for use in inflating automobile tires are on the market, and after a lapse of popularity caused by spare tires and free air, an improved system is now being introduced. Carbon dioxide is still applied to the operation of outlying railway signals,[20] while among the earliest applications was its use as a motive power in torpedoes[21].

It is now coming into favor for operating paint spray nozzles where the amount of compressed gas required is small, or the location inaccessible to air compressors. The absence of fire risk is a desirable feature.

Fire Extinction and Prevention

Carbon dioxide functions as a fire extinguisher by excluding oxygen from burning substances, or by so diluting the air that combustion is kept from spreading or is extinguished. It follows that this gas is most effective when applied to fires in enclosed spaces, although it can be used advantageously literally to "blow out" a small fire in the open.

In electrical fires its use is limited to apparatus which is or can be sufficiently enclosed to confine the gas. Two large power companies have equipped turbo-generators with carbon-dioxide extinguishing equipment, which is so designed that fire can be prevented from spreading within a minute or two of its discovery.[22] In consideration of the theoretical advantages of the dry, non-conducting, non-corrosive, non-poisonous carbon dioxide over steam and carbon tetra-chloride, steady progress in this field is to be expected. Work has also been done on the protection of transformers from fire and explosion by maintaining an atmosphere of carbon dioxide above the oil in the transformer. Some liquefied carbon dioxide is also sold for extinguishing fires in telephone switchboards, where its non-corrosive nature is of importance, and the fact that it cannot short-circuit the wiring is a great advantage.

In marine fires carbon dioxide was first proposed many years ago[23]. Two[24] different systems of carbon dioxide fire extinction are on the market, and both have made many friends among shipowners. As an extinguisher for marine fires, carbon dioxide possesses many advantages. It does not damage cargo, it does not fill the holds with water, and it does not detract from the buoyancy of the vessel. It pervades the holds and reaches places which would be difficult to reach with other agents; and, on account of its specific gravity and boiling point, it fills the holds from the bottom up, forcing out the air, instead of condensing on cold surfaces, or merely "mixing up" the atmosphere in the holds. Practical tests of the scheme on coal fires in bunkers have given excellent results, and the system seems capable of preventing the spread of flame and permitting the safe arrival of the vessel in port even where the amount of heated material is too great to cool below its ignition point. A case in point is a fire in a cargo of calcium carbide, which was unloaded piecemeal without accident, the fire being kept under control by means of carbon dioxide. This is an illustration of a type of safe cargo which would have been made hazardous by unintelligent treatment.

Fires in liquid flammable materials can be extinguished or prevented under some conditions by the proper application

*Part II. and concluding instalment of this article. Part I. appeared in our July Issue.

15. Chem. Met. Eng., 25 (1921), 729.
16. W. K. Lewis, U.S. Patent, 442,265.
17. The Barrett Co., British Patent 158,852
18. Wells and Wells, U.S. Patent 1,433,052.
19. C. E. Munroe, U.S. Census of Manufactures, 1905. Bulletin 92, "Chemicals and Allied Products," page 93.
20. C. E. Munroe, Loc. Cit., p. 93.
21. Munroe and Chatard, "Special Report on Chemicals" to accompany the 12th Census, 1900, p. 609.
22. Wheeler, Elec. World, 80 (1922), 165; Soren, idem, 80 (1922), 1089.

of liquid carbon dioxide. Large manufacturers of electrical equipment use considerable carbon dioxide in pressure autoclaves in processes of impregnating coils with insulating compounds. In the case of oil fires, other means of fire extinction are usually more effective and convenient, but one of the larger petroleum companies has provided its tank steamers with extremely simple automatic extinguishers by hanging carbon dioxide cylinders provided with fusible plug outlets in the top of each oil tank. One great advantage of this scheme, as compared, for example, with foam extinguishers, is the non-freezing feature.

Carbon dioxide is used as an inert gas for the prevention of dust explosions,[25] being applied in milling cereals. Along similar lines is the proposal to store wheat in carbon dioxide. Thirteen cubic feet of gas is said to be sufficient to fill the interstices in one ton of wheat, and it is argued that, in addition to the fire protection afforded, the carbon dioxide would prevent destruction of grain by pests, killing insects and rodents, and inhibiting the development of eggs or spores in the grain. Similar proposals have been made for safeguarding the storage of other materials; and, on account of its relatively harmless and inert nature, the gas may be successfully applied to some of these storage problems in the future.

Since the earliest successful attempt[26] to smother a mine fire by introducing inert gases at Clackmannan, Scotland, in 1851, several trials have been made of the use of carbon dioxide for extinguishing fires in coal and metal mines, and also in coal storage piles.

These various attempts have ranged from complete failure to entire success, depending upon the conditions of application. In treating a mine fire, the carbon dioxide serves mainly as a neutral gas for preventing the infiltration of oxygen to feed the fire, rather than by any specific property of its own. It is obvious that a fire hermetically sealed will smother itself with its own products of combustion, but conditions met with in practice never permit of hermetic sealing. When the heat developed from a mine fire, for example, is equal to the heat dissipated, it is evident that conditions in the supposedly sealed-off portion will remain stationary indefinitely. Where leakage is of such small magnitude that heat is dissipated more rapidly than it is generated by combustion, a mine fire may be extinguished by its own gases[27], and indeed this method is successful with many fires. As the magnitude of the heat generated, which is proportional to the air leakage, approaches that dissipated, the period of cooling required for such a sealed-off fire approaches infinity. If, now, carbon dioxide is passed into the sealed-off area, it is seen that, under the best conditions, and especially when the cooling of the gases is causing considerable contraction, each volume of carbon dioxide introduced prevents the infiltration of an equal volume of air. It is to this and not to the cooling effect of the gas itself that the unexpectedly rapid cooling observed in some carbon dioxide treated fires is due. Whereas the total heat of one pound of carbon dioxide at 88.4°F. (over 32°C.) is only 57.8 B.t.u. per pound, the air excluded by one pound of carbon dioxide could develop as much as 400 B.t.u. by combining with the coal, and therefore this amount of cooling is made directly effective by the use of carbon dioxide.

Carbon dioxide is also of assistance in damping the breathing effect due to variations in barometric pressure. It may be stated further that the inert-gas method of extinguishing mine fires is most effective under careful chemical control, to ensure the appliation of the proper amounts of gas at the right places. No statement can be made as to the quantity required, which depends entirely upon the amount of unavoidable leakage. It is obvious that ,in the case of a fire in which inward leakage of air is just sufficient to equalize the heat loss by radiation, conduction, and convection, a very small amount of inert gas would upset the balance and cause the mine to cool.

The same general considerations apply to extinction of fires in coal and other flammable materials in storage. A fire in a 3,000-ton coal-storage pile in Stockholm, Sweden, in 1915, was extinguished successfully with less than 1,500 pounds of carbon dioxide. The expense involved was certainly much less in this case than the probable cost of piecemeal extinction with water, but the method has not yet found favor with American engineers on account of unfamiliarity with its possibilities, and on account of the surmountable difficulty of making a correct diagnosis of the extent of the trouble and of the probable percentage effectiveness of the gas in particular cases. The system of storing coal in non-oxidizing atmospheres, said to be successfully applied in Germany at the present time, is receiving attention at present from the U.S. Bureau of Mines and others. In view of the great advantages of safe and economical coal storage at the present time, the subject is one worthy of most careful consideration.

Medical Uses

Functionally, carbon dioxide acts as a mild irritant and stimulant, has a direct specific action on the nerve centre controlling respiration, acts as a refrigerant in the form of carbon dioxide snow, and in very high concentrations produces effects due to cutting off the supply of oxygen, and preventing oxidation in the tissues. Haldane[28] gives the effects of breathing carbon dioxide as follows:—

Percentage of carbon dioxide in atmosphere	Effect on man
3.5	Breathing deeper
6.0	Panting
10.0	Severe distress
15.0	Partial unconsciousness[29]
25.0	Final death

If oxygen deficiency is excluded by inhaling gas mixtures containing 20 per cent. of oxygen, 20 per cent. of carbon dioxide is not dangerous in an hour to animals, and probably not to man. The popular ideas of the role of CO_2 in impure air are greatly exaggerated, for neither the presence of CO_2 nor the absence of oxygen explains the harmful effect of sojourn in ill-ventilated rooms[30].

It should be emphasized that carbon dioxide is not poisonous, but, like water, does not support combustion; hence life will drown in either. The use of carbon dioxide for humane killing of animals has been proposed, and recently it has been used for this purpose in a dog pound. Used in the storage of grain, fruits, etc., it may eliminate vermin and insects if the percentage of carbon dioxide is so high as to make the atmosphere irrespirable. Its inhibitive action on certain aerobic bacteria may be due in part to similar functioning.

Carbon dioxide snow has been much used as an ascharotic, for local refrigeration anesthesia, and as a cauterant, but is now only one of a considerable number of therapeutic agents for similar purposes, and hence is not used as much as formerly.

In the form of carbonated baths, especially the celebrated Nauheim baths, the cutaneous stimulation of carbonic acid is used to increase the peripheral circulation, particularly in cardiac diseases. Solman[31] states that, in the stomach, carbonated water ("soda water") hastens absorption, increases the secretion of acid gastric juice[32], and acts as a carminative. It is useful against nausea and valuable for disguising the taste of medicines.

23. F. M. Barber, Am. Chem., 5 (1875), 395.
24. The "Lux" system is installed on many vessels of Scandinavian registry. The "Rich" system, including a fire-detection device based upon the Tyndall effect, is installed in this country by Walter M. Kidde and Company, 90 West Street, New York, N.Y.
25. Price and Brown, "Dust Explosions," National Fire Protection Association, Boston, 1922, p. 93.
26. Walker, Mines and Minerals, 1908, 505.
27. U.S. Bureau of Mines, Reports of Investigations, No. 2325 (1923).
28. Mines and Minerals, 1908, 505.
29. On the use of Carbon Dioxide as an Inhalation Anaesthetic, see Brit. Med. J. 1912, 843.

Utilization of carbonated waters therapeutically for mild catharsis is explained by the fact that carbonic acid introduced into the stomach causes a notable increase in gastric contractions and evacuation through the pylorus[33].

The use of carbon dioxide as a respiratory stimulant is well established and is rapidly increasing in importance. A very slight increase in carbon dioxide content of the alveolar air results in considerable increase in pulmonary ventilation rate; a rise of 0.2 per cent. causing a twofold increase in breathing. This has been successfully applied to the treatment of shock, and more recently has made possible great advances in the technic of treating carbon monoxide asphyxia, so that it is now possible to secure very rapid recovery in some cases which would have been hopeless not many years ago[34].

Miscellaneous Uses

Carbon dioxide finds some application in the rubber industry as a material for filling the air-bags which support tires in process of vulcanizing. At vulcanization temperatures, air exerts considerable deleterious oxidizing effect, but the substitution of carbon dioxide for air has consistently produced considerable increases in the life of the air-bags.[35] It has also been used as a non-oxidizing atmosphere in ovens, for vulcanizing mechanical rubber goods.

Carbon dioxide has a much higher solubility in indiarubber than any other common gas, and this interesting fact is applied in the patent of Williams[36], who substitutes carbon dioxide for air as the absorbed gas on particles of filler, thus preventing tbe formation of air bubble from these absorbed gases during vulcanization. Solubility in rubber is also of interest in connection with the preparation of cellular compositions containing bubbles of carbon dioxide, which are attracting attention as promising materials for heat insulation in refrigeration work[37], having a lower thermal conductivity than cork or other common insulating materials.

An interesting use for carbon dioxide is in removing boiler scale. Cross and Irwin[38] have reported that carbon dioxide was a successful means of removing an extremely hard and adherent scale that would have been difficult to remove by other means. Although the scale removed in this large scale trial was high in silicates, it is probable that the carbon dioxide acted through the changing of a carbonate binder to the bicarbonate condition, thus loosening the entire scale, which was flushed out with a hose at the conclusion of the carbonic acid treatment.

Carbon dioxide added to lime-soda softened water changes the residual saturated solution of calcium and magnesium carbonates to the bicarbonate condition, and thus militates against the deposition of carbonates in piping and on the particles of sand filters by such water. The gas is at present in use for this purpose, liquefied carbon dioxide finding economical application to smaller installations, while flue gases are applied to at least one city water supply.

Possibilities of Carbon Dioxide

An extremely interesting recent development is the introduction of carbon dioxide into greenhouses, and, in Europe, even into truck gardens, as a fertilizer. In a general way, the ordinary fertilizers containing phosphorus, nitrogen, potassium, etc. enter into the composition of growing plants in only small proportions, and bear some such relation as iodine, mineral salts, and vitamins do to the growth of the human body. However, just as the bulk of human foods is composed of carbohydrates, fats and proteins, the bulk of the plant food is water and carbon dioxide, and it seems odd to reflect that so simple an expedient as increasing the food of the plant should be a recent and patentable development. Perhaps it is because we have become accustomed to fertilizers that we can see, and smell. At any rate, important commercial results are being obtained under a patented process[39] in the growing of flowers, and the application of the method to truck gardening in Germany has already been pronounced a commercial success.

Enough uses for carbon dioxide which are still in the developmental stage have been included herein to indicate some of the new directions in which carbon dioxide is being applied. New uses still appear rather frequently, and it seems only fair to state that in carbon dioxide we have a material whose utility has sometimes been overlooked because of its very familiarity.

March 27th, 1923. Chas. L. Jones,

30. Sollman, "Manual of Pharmacology," Philadelphia, 1918, p. 606.
31. Sollman, ibid., p. 605.
32. Chiari, Ther. Mon., 29 (1915), 202.
33. Compt. rend. soc. biol., 87 (1922), 613–16).
34. Henderson and Haggard, Report of the Commission on Resuscitation from Carbon Monoxide Asphyxia, to the American Gas Association, J. Am. Med. Assoc., 79 (1922), 1137–45.
35. H. R. Minor, India Rubber World, 67 (1923), 353.
36. British Patent 182,422, 1922.
37. Special Report No. 5 on Heat Insulation by the Engineering Committee of the Food Investigation Board, Department of Scientific and Industrial Research, London, 1921.
38. Power, 55 (1922), 422–3.
39. American rights on the Riedel patents on carbon dioxide fertilization are owned by the General Carbonic Company, of New York, N.Y.

ANALYSIS BY X-RAYS

Among the papers presented at the meeting of the Deutsche Bunsen-Gesellschaft for Applied Physical Chemistry, held at Hanouer, Germany, May 10th to 13th, was one by Dirk Coster, of Copenhagen, on Qualitative and Quantitative Chemical Analysis by Means of X-Rays, an abstract of which is given below:—

If one sends a narrow beam of X-rays through a slit, and reflects them from a crystal surface, and photographs the reflected beam, there appears on the plate a sharp "spectral line," which is characteristic of the element present in the anticathode surface of the X-ray tube. Every element has its characteristic X-ray spectrum, by which it may be recognized.

The characteristic X-ray spectrum of the various elements is such that the square root of the frequency of a definite line varies as the atomic number of the element emitting the X-ray.

It follows, then, that the X-ray spectroscope is useful in identifying the chemical elements. This method may also be used for quantitative analysis, and leads to a result much more quickly than purely chemical methods. If one wishes, for example, to determine how much of a certain element is present in any given mineral, the following procedure is adopted. A known mass of some element not far removed in the periodic system is mixed with the mineral, and the X-ray spectrium of the mixture is photographed. By comparing the intensities of the X-ray line of the known element with the element to be determined, the amount of the latter may be found. The amount of an element may, in this way, be determined, with an accuracy of 10% to 20%. This method was used in the determination of the Hafnium content of the various zirconium minerals and Hafnium preparations in the purification of Hafnium.

RESEARCH COUNCIL'S FELLOWSHIPS, STUDENTSHIPS AND BURSARIES

The Research Council of Canada has recently announced the granting of its fellowships ($1,200 each), studentships ($1,000 each) and bursaries ($750 each) to be held in Canadian universities for the year 1923-24. Six fellowships are awarded at Toronto University, one at the University of British Columbia, three at McGill and two at the University of Manitoba. Of the studentships, three go to Toronto, four to McGill, and one each to British Columbia, Saskatchewan, Queens, and Dalhousie. Seven bursaries were awarded at McGill, three at the University of British Columbia, three at Queens, two each at Toronto, Manitoba, MacMaster and Alberta, and one each at Saskatchewan, Montreal, Ontario Agricultural College, and Mount Allison.

Methode Rapide d'estimation du Gras Dans la Creme Glacée

By Professeur P. P. Le Cointe*

PENDANT la guerre, un ordre en conseil fixa le maximum de gras dans la crème glacée à 10 pour cent, pour des raisons d'économie. Les fabricants de Montreal étaient persuadés à cette époque, comme le public l'est encore que c'était la quantité de gras qui constituait la qualité de la crème, et désiraient, par suite, préparer de la marchandise contenant le plus possible de gras, sans cependant dépasser la limite légale.

Il était donc impératif de contrôler le "mix," c'est-à-dire le mélange de crème, sucre et le reste qui constitue la crème glacée, et de contrôler également le produit fini. Le procédé devait être rapide. La méthode et les appareils Babcock, employés dans toutes les laiteries, paraissaient les plus convenables, et le présent exposé montre les résultats obtenus.

Dans l'essai Babcock, l'état colloidal de la solution de caséine est détruit, et les globules gras, ainsi libérés de leur émulsion, sont soumis à la centrifugation dans des bouteilles spéciales munies d'un col gradué. On ajoute de l'eau pour amener le gras dans le col, et l'on peut lire sur la graduation son volume.

On trouve dans les publications sept méthodes d'essai de la crème glacée par la méthode Babcock.

M. H. H. Dean, Professeur au Collège de Laiterie deGuelph, Ontario, propose trois méthodes, se servant comme réactif dissolvant la caséine de

(1) l'acide sulfurique.

(2) l'acide acétique, puis l'acide sulfurique.

(3) le mélange d'acide acétique glacial et d'acide chlorhydrique[1]. M. C. A. A. Utt, du Laboratoire des produits alimentaires, Ecole d'agriculture de l'Etat du Kansas emploie

(4) un mélange d'acide acétique et d'acide sulfurique[2].

M. Mortensen, dans le Bulletin No. 180 du Collège d'Agriculture du Iowa, décrit une méthode due à MM. Coover et Rudnick.

(5) Ils se servent d'une solution de gélatine et d'acide sulfurique, puis, après avoir centrifuger, ils décantent le liquide, diluent dans l'eau le résidu solide, et le traite de nouveau par l'acide sulfurique[3].

C'est avec une fiole spéciale que M. J. A. Halverson applique son procédé:

(6) Cette fiole est munie d'un robinet à la partie inférieure, qui sert à décanter le liquide. C'est à peu près la même méthode que la précédente, mais sans employer de gélatine[4].

La méthode suivante a été publié comme annonce par l'International Equipment Co., postérieurement à nos recherches, et nous ne l'avons pas essayé.

(7) Elle est due à M. H. F. Lichtenberger, chimiste de la Hoefler Ice Cream Co., de Buffalo, qui emploie de l'acide acétique avec une goutte d'acide nitrique, puis de l'acide sulfurique.

Voici comment se présentait le problème: Il fallait 1. une méthode d'essai rapide et suffisament exacte; 2. une colonne de gras, dans le col de la bouteille, parfaitement claire, sans particules noires de matières carbonisées, ni caillot blanc de caséine; 3. un procédé facile à apprendre sans un apprentissage trop long.

* Chief des Laboratoires de Chimie Industrielle a l'Ecole Polytechnique Montreal. Professeur de Technologie Ingenieur. Conseil de la "Solex Co., Ltd."

1. The Baker's Confectioner, Toronto, Aout, 1915.
2. Jnl. of Industrial and Engineering Chemistry, Semptembre, 1915.
3. Creamery and Milk Plant Monthly, Octobre, 1918, page 68.
4. Jnl. of Ind. and Chem., Janvier et Juin, 1913.

Les cinq premières méthodes ont été essayées comparativement à la nôtre. Un accident détruisit, il y a deux ans, pratiquement toutes nos notes de laboratoire, et il ne nous est pas possible de donner des résultats numériques. Chaque échantillon était analysé en double par la méthode Roese-Gottlieb, puis les diverses méthodes essayées sur le même échantillon, toujours en double.

La méthode No. 1 donne rarement des résultats bons. Les autres donnent des valeurs s'accordant à 0.5 près avec les résultats analytiques, quand elles réussissent. Mais l'on n'est jamais sûr de réussir, à cause des proportions variables de réactifs à employer suivant la composition de l'échantillon. Comme la proportion de gras de l'échantillon est inconnue, on est obligé de tâtonner.

Dans notre méthode, nous employons de l'acide sulfurique et de l'alcool amylique. Les résultats concordent à 0.3 près de ceux donné par l'analyse, la colonne de gras est très claire, et le procédé facilement appris. En fait, un chimiste le réussira du premier coup, et deux ou trois essais seront suffisants pour le manipulateur ordinaire de laiterie. Les proportions ne sont pas modifies pour des pourcentages de gras de 6 à 24 pour cent.

Après étude approfondie des meilleurs quantités de réactifs à employer, nous avons établi le procédé comme suit:

Pesez 9 grammes d'échantillon dans une bouteille à lait de Babcock, ajoutez environ 9 grammes d'eau et 9 grammes d'acide sulfurique (de densité 1.84). Ajoutez 1.5 cc. d'alcool amylique, mélangez et procédez comme pour un Babcock ordinaire. Multipliez le résultat par 2. Durée de l'essai: 10 minutes.

Cette méthode a été employée depuis 1918 par la Montreal Dairy Co., et J. J. Joubert Ltée, jusqu'à ce que ces compagnies eurent acheté un appareil Mojonnier, et elles l'emploie encore quand le temps presse.

L'appareil Mojonnier est une combinaison ingénieuse et compacte de plaques chauffantes, étuves à vide, dessicateurs à refroidissement d'eau, centrifuge, et le reste, qui, à l'aide d'un certain nombres d'instruments spéciaux, et une procédure taylorisée, permet à un opérateur d'effectuer la détermination de la richesse en gras par le procédé Roese-Gottlieb sur de un à huit échantillons en 30 minutes environ.

Une modification de notre méthode a été imaginée par M. A. de Chaunac, chimiste de la Montreal Dairy, qui substitue à l'alcool amylique l'alcool butylique normale. Cette dernière présente quelques avantages, étant stable, facilement purifiée, sans odeur et meilleur marché.

Voici la méthode: Ajoutez à 18 grammes d'échantillon pesés dans une bouteille de Babcock (ou à 9 grammes d'échantillon et neuf grammes d'eau) 2 cc. d'alcool n-butylique, puis 9 grammes d'acide sulfurique, et procédez comme pour un Babcock ordinaire.

En comparant les deux méthodes, on trouve une différence de moins de 0.15 pour la première et de moins de 0.10 pour la seconde avec le pourcentage obtenu par le procédé Roese-Gottlieb-Mojonnier.

En terminant nous tenons à remercier M. E. Giguère, maintenant chimiste du Laboratoire Municipal de Montreal, qui exécuta un grand nombre des essais comparatifs; Les Compagnies Montreal Dairy et J. J. Joubert qui fournirent gracieusement les échantillons, et M. A. de Chaunac qui nous a autorisé à publier sa modification.

PERSONAL

Mr. George M. Appel, formerly associated with the Canadian Industrial Alcohol Co., has been appointed superintendent of the industrial alcohol plant of the Federal Chemical Co., at Nitro, W. Va., which has acquired the ether and alcohol unit of the former government munitions plant at Nitro.

DEATH OF DR. POTVLIET, F.C.I.C.

Dr. Mich. P. C. Potvliet, chemist, Dominion Sugar Company, Chatham, Ont, died suddenly at his home in Chatham, August 3rd. Dr. Potvliet was born in Amsterdam, Holland in 1866, and graduated from the University of Amsterdam, obtaining the degree of Ph.D. in Chemistry. From 1892-99 he practiced his profession in Amsterdam as a consulting chemist, specializing in sugar refining. From 1899-1908 he was superintendent of chemical plants at Aranje and at Naarden, Holland. Coming to America in 1908 he was for four years chemist for the American Beet Sugar Co. at Rocky Ford, Colorado, leaving that position in 1912 to become chief chemist for the Dominion Sugar Co. at Chatham, Ont., which position he held until his death. He was elected a Fellow in the Canadian Institute of Chemistry in May, 1920, and always took an active interest in his profession, especially in his chosen field. He had contributed several papers, principally on sugar refining, to the technical press, and was recognized by his associates as a very able chemist thoroughly conversant with the problems of the industry he served.

FORTY-FOURTH MEETING AMERICAN ELECTROCHEMICAL SOCIETY IN DAYTON

The Fall meeting of the American Electrochemical Society, September 27, 28 and 29, gives promise of being one of the most interesting sessions ever held by this Society. The papers and discussions will be of particular interest to electrical men, chemists, foundry men and electroplaters.

Dayton, Ohio, has been chosen as the place of meeting with headquarters at the Miami Hotel. The technical meeting will be devoted to a symposia on "Electrochemistry of Gaseous Conduction." Mr. Duncan MacRae, of the Research Department of the Westinghouse Electric and Manufacturing Company, will act as chairman. This session will include a number of most interesting papers and discussions on triatomic hydrogen, ozone, X-ray tubes, audions, neon lamps, Beck arc, oxidation of atmospheric nitrogen, etc. A number of very interesting papers are in the course of preparation by men who are well qualified to discuss these respective subjects.

The other subject of the symposia covers "Recent Developments in Electrolytic Refining of Metals." Mr. F. R. Pyne, of the U. S. Metals Refining Co., Carteret, N.J., will act as chairman. This program will embody papers on copper, tin, lead, nickel, zinc, iron, etc.

An innovation of this meeting will be a round table discussion on the following four subjects:—Electric furnace brass foundry practice, utilization of chlorine, organic electrochemistry, and electroplating. These round table discussions will be presided over by men recognized as authorities on these particular subjects.

To those interested in excursion trips to industrial plants and places of interest, Dayton offers a large number of attractions. Among the larger plants are National Cash Register Company, Delco-Light, General Motors Research Laboratories, McCook Field, Wilbur Wright Field, Miami Conservatory. The American Rolling Mills are located only a short distance away and will be open for inspection.

The social side of the meeting will not be entirely neglected. Dayton offers three golf courses, of which advantage will be taken. It is expected that the attendance of the membership will be one of the largest in the history of the Society. A cordial welcome is extended to all non-members interested in electrochemistry to attend all technical meetings and discussions. Complete information can be secured later by conferring with Dr. Colin G. Fink, secretary of the American Electrochemical Society, Columbia University, New York, N.Y.

MACDONALD COLLEGE NEWS ITEMS

Mr. R. R. McKibbin, B.S.A. (McGill), has been appointed to an Industrial Fellowship supported by the Texas Gulf Sulphur Company in the University of Maryland and the Maryland Agricultural Experiment Station.

Mr. McKibbin, who graduated from Macdonald College this year, was the successful candidate for assistantships in two other agricultural colleges in the United States, and was also in demand for an industrial position in Canada. Mr. McKibbin is a student member of the Canadian Institute of Chemistry.

Mr. L. O. Rolleston, B.S.A. (McGill), one of this year's graduates of Macdonald College, has accepted a position with the Abitibi Power and Paper Company at Iroquois Falls, Ont. Mr. Rolleston, who is a native of Demerara, British Guiana, was offered a position with the Demerara Bauxite Company, Georgetown, Demerara, and one with the Milton Hersey Company, Montreal. Mr. Rolleston was a student member of the Canadian Institute of Chemistry.

Dr. Milton Hersey, of Montreal, has recently established a scholarship for graduate study in Macdonald College, stipulating that in its award preference should be given to students intending to engage in the study of the agricultural applications of the science of chemistry. For this scholarship which has just been awarded for the first time, there were several well-qualified candidates. The appointee for 1923-24 is Mr. Walter A. DeLong, B.S.A. (Toronto).

Mr. DeLong is a graduate (1920) of the Ontario Agricultural College and has had one year's teaching experience in an agricultural high school in Alberta and two year's experience as assistant in chemistry in the Nova Scotia Agricultural College.

The results of an investigation on sulphur and soil acidity made by him were published as a contribution to Scientific Agriculture (Ottawa) in June. Mr. DeLong is an associate of the Canadian Institute of Chemistry.

PERSONAL

Mr. R. H. McIntosh, a graduate of the University of British Columbia, has accepted a position as assistant chemist in the laboratory of the Whalen Pulp and Paper Mills, at Port Alice, British Columbia.

Mr. A. H. Heatley, formerly demonstrator in the Department of Chemistry, University of Toronto, has taken a position with the Roessler and Hasslacher Chemical Co., New York, chemical manufacturers.

Mr. W. A. Davidson, formerly assistant chemist in the laboratory of the Dominion Public Health Department, Winnipeg, has been transferred to Vancouver as director of the Dominion Health Laboratory for British Columbia.

Mr. J. A. Ridgway, of Toronto, has been appointed to the sales staff of E. A. Schofield & Company to handle their interests in Toronto and Ontario. He brings to his new work extensive selling and manufacturing experience in chemical lines. Mr. Ridgway will occupy offices at 921 Bank of Hamilton Building, Toronto.

Mr. Samuel J. Lawellin, chemist, formerly with Milton Hersey Company Limited, Winnipeg, Man., is now with Wallace & Tiernan Co. Inc. at Minneapolis, Minn. His work covers the United States and Canada in all chemical matters pertaining to flour mills.

DR. BANTING GRANTED LIFE ANNUITY

Dr. F. G. Banting of Toronto, whose recent work on insulin has attracted world-wide attention, has been voted a life annuity of $7,500 by the Canadian Parliament to enable him to devote his life to medical research.

Work of Dominion Government Chemists

PUBLIC WORKS LABORATORY.

This laboratory was established about 1890 for the purpose of testing all the cement used by the department. Later it was enlarged to include the testing of concrete aggregates and concrete mixes, and still later tiles, bricks, reinforcing materials and limes and plasters were included in the work carried out. During the last eight or nine years the laboratory has taken over the testing of all structural and building materials, and all other articles purchased by the department; the reason for this being that the department felt that it was more convenient to control their own testing as in the majority of cases results are required in a very short time so that construction or tenders may not be held up.

The laboratory as it is now is purely departmental, and no work is carried on for other departments or outside interests unless the request comes directly through the Deputy Minister. All materials used by the Public Works engineers or contracts, and goods bought by the departmental purchasing agent are subject to test in this laboratory, and must conform to specifications usually drawn up by this laboratory for the department.

The staff of this laboratory has increased from one, at its inception, to nine permanent employees and two temporaries during the summer months. Structural and road materials of all kinds are tested.

CUSTOMS AND EXCISE LABORATORY.

One of the functions of the Government is to regulate and obtain revenue from the exports and imports of commodities of every description. It follows logically that the chemist will play an important part in the administration and control of the tariff laws and regulations.

The chemical laboratories of the Department of Customs and Excise, now two in number, were among the earliest to be established in Ottawa.

At the present time the staff consists of six chemists and several laboratory assistants.

The work required for the enforcement of the Excise regulations chiefly requires the determination of alcohols, the examination and control of denaturants and the standardization and supervision of hydrometers. Much control work on raw sugars and molasses is carried out. Many technical matters concerning Excise regulations requiring chemical knowledge are also submitted for opinions.

The work required by the Tariff regulations is exceedingly varied, and requires considerable experience and encyclopedic knowledge of the composition and properties of drugs, proprietory articles and manufactured products of all kinds, besides close acquaintance with the thousand and one Customs regulations.

When Goods are entered by the importer he naturally looks for the lowest tariff item which he considers they will fall under. In many cases he is ignorant of the character of the goods himself. When the Customs appraisers think that the article is entered under the wrong classification it is usually submitted to the laboratory for an opinion.

Time is an important element, as often shipments on which large sums of money depend are held up pending a decision, and the Customs' chemist must give a speedy answer. Therefore the chief aim is to establish the nature of the product rather than to carry out extended analyses. Occasionally these are specially required.

In November, for example, in both laboratories, about two hundred and fifty samples were examined. They ranged from Chinese pills and medicines (for narcotics), through dyes, face creams and rouges, tar oils, cements, alloys, soap and washing powders, ores, fish offal, Christmas puddings, all kinds of patent medicines, to steels and metallurgical products.

Besides such analytical work the Chief Chemist is often called upon for opinions on the many technical matters that arise in formulating and enforcing the Customs' regulations.

(Editor's Note.—This article concludes the series dealing with laboratory and research work of Canadian Government chemists. Men with specialized chemical knowledge and training are employed in the departments of statistics and the Patent Office. The Dominion Government is so far the largest single employer of chemists in Canada, and the Editor hopes that this series will be of assistance to those considering Government service.)

PROGRAM FOR MARITIME CHEMISTS' MEETING

Outline Program for the joint meeting of the Maritime Chemists' Association and the Maritime Branch of the Canadian Institute of Chemistry to be held in the Annapolis Valley, August 23rd and 24th, 1923.

THURSDAY, AUGUST 23rd—

Assemble at Annapolis Royal. Train arrives from west at 12.20 p.m., from east 1.03 p.m.
1.15 p.m.—Dinner at Annapolis (Queen Hotel).
2.30 p.m.—Leave Annapolis by automobile. Inspection of orchards around Bridgetown and Lawrencetown and of vinegar and cider factories at Aylesford and Berwick.
6.30 p.m.—Supper at Waterville.
7.30 p.m.—Leave Waterville.
8.30 p.m.—Arrive at Wolfville.

FRIDAY, AUGUST 24th—

9.00 a.m.—Leave Wolfville by automobile for the Experimental Farm at Kentville. Inspection of experiments on dusting, spraying, etc.
12.00 noon—Inspection of dust-mixing plant, Kentville.
1.30 p.m.—Dinner, Kentville.
2.00 p.m.—Arrive Wolfville, 2.15 p.m.—Business Meeting, followed by technical papers, Carnegie Science Hall, Wolfville.
2.15 p.m.—Drive about Grand Pre for ladies.
6.00 p.m.—Supper.
7.30 p.m.—Technical Papers and Papers of popular interest.

Correspondence should be directed to Prof. D. U. Hill, F.C.I.C., Wolfville, N.S.

NEW MEMBERS, CANADIAN INSTITUTE OF CHEMISTRY

The following have been elected to membership in the Canadian Institute of Chemistry:—

FELLOWS (F.C.I.C.)

Professor E. H. Archibald, Department of Chemistry, University of British Columbia, Vancouver, B.C.

John Reid, Chief Chemist, Lever Bros., Limited, Toronto, Ont.

ASSOCIATE (A.C.I.C.)

Rev. Brother Gabriel, 99 St. Joseph St., Toronto, Ont.

Howard B. Meyer, Chemist, Canadian Grape Products, Jordan, Ontario.

NATURAL SALTS DEPOSITS OF WESTERN CANADA ARE BASIS FOR IMPORTANT INDUSTRY

The prairie provinces of Canada are classed primarily as agricultural areas and up to the present time they have not been considered seriously as probable contributors to the mineral wealth of the country. Recently, however, the resources of these provinces in non-metallic minerals, such as clays, coals, oil, gas, and the sodium and magnesium salts which occur in the numerous alkali lakes and sloughs throughout the area, have been attracting the attention of capital, with the result that considerable activity is evidenced in all these lines.

The increased interest in the alkali deposits of Western Canada has induced the Mines Branch of the Department of Mines, Ottawa, to institute a detailed investigation of these deposits, with a view to determining their probable economic value and the extent of reserves. The work has now been in progress under the direction of L. H. Cole during the last two field seasons.

Natural occurences of soluble mineral salts are known in the Provinces of Manitoba, Saskatchewan, Alberta and British Columbia, either in the form of bedded deposits or as brines. Some are of considerable extent and are probably of sufficient size to warrant commercial exploitation, provided economical methods of recovery can be developed and sufficient markets can be established.

Deposits Being Operated

Three of these deposits are being operated, or will shortly be operated, in the prairie provinces, and plans are under way for the development and operation of a fourth deposit.

At Dana, Saskatchewan, a half-million dollar plant is nearing completion, to extract salt cake and other chemical products from the brines of Muskiki lake, formerly Houghton lake, 23 miles west of Humboldt, Sask. The company operating this deposit is The Salts and Chemicals, Ltd., controlled by Canadian and United States interests. The main plant of this company is at the deposit at the lake and they have a refining plant at Kitchener, Ont. When this plant is in operation, it is estimated that the output will be 30,000 tons of salt cake per year, besides Epsom and other salts recovered as by-products. A small village has been erected at the lake, with housing accommodation for 60 men. When the plant is working at fuller capacity, 100 men are to be employed.

Sodium Sulphate Plant

At Frederic lake, five miles south-west of Dunkirk, Sask., and 38 miles from Moose Jaw, Sask., another salt cake recovery plant has been erected by The Bishopric and Lent Company, with head offices at Cincinnati, Ohio. This plant is practically completed, with a capacity of 50 tons of salt cake per day; and as soon as it proves commercially successful further units are to be added to increase the output to 200 tons per day. At the present time, 20 men are employed at this plant.

At a lake five miles north of Fusilier, Sask., an experimental plant has been operated by a company called Soda Deposits, Limited, with head office at Calgary, Alta. This deposit, although somewhat smaller than some of the other deposits, contains sodium sulphate in a very pure state and several shipments have already been made. This company hopes in the near future to be in a position to put its product regularly on the market.

In British Columbia, the Basque Chemical Co. is operating a series of five lakes situated 15 miles west of Ashcroft, B.C. From these lakes they are excavating crude magnesium sulphate (Epsom Salts), which is shipped to Vancouver, where it is refined and sold as medicinal salts, and to the tanning industry.

In the vicinity of Meadow lake, 50 miles north of Clinton, B.C., the Lillooet Soda Company is operating a sodium carbonate lake, and shipping their product to Vancouver, over the Pacific Great Eastern railway. This material is being disposed of at the present time to the soap manufacturers of the Pacific coast, but plans are under way to dry the material at the lake and increase the output.

The Main Products

The several main products which may be expected to be produced from these deposits are Glauber's salt, salt cake, Epsom salts, soda ash and baking soda.

Sodium sulphate in the anhydrous form, more commonly known by its trade name of salt cake, finds it chief use in the manufacturing of sulphate pulp, in metallurgical work, in the refining of nickel, in the manufacture of window, plate and bottle glass and in making water-glass. In the hydrous from it is marketed as Glauber's salt, and as such is used in tanning, in the textile industry as a mordant, and in medicine.

Hydrous magnesium sulphate, or Epsom salts, is largely used in the cotton trade for warp-sizing; it is also employed for medicinal and agricultural purposes, and in dyeing with aniline colors, since goods thus treated are found to withstand the action of soap better than those not so treated.

Sodium Carbonate

Sodium carbonate in the anhydrous form, known under the trade name of soda ash, is one of the principal forms in which sodium salts are used in the alkali industry, since it frequently forms the base from which other sodium compounds are made. It is used extensively in the manufacture of glass, soap, and dyes, as well as in cleansing preparations, metallurgical processes and tanning. In the hydrous form it is marketed under the trade name of sal soda, washing soda or crystal carbonate, and as such is used in softening water and to replace soda ash when purity is essential. Sodium bicarbonate, or acid sodium carbonate, commonly known as baking soda, is generally marketed in a very pure form, and finds its principal use for making baking powders.

The operations of these companies tend to bring before the public the possibilities of the western provinces in the mineral field and should form the nucleus of an ever-increasing industry, which in time should prove of great importance to the whole of Canada—*Prepared under the direction of Dr. Charles Camsell, Deputy Minister of Mines, by Dr. A. W. G. Wilson, Chief Engineer, Mineral Resources Division.*

MINERAL COLOURS. EGYPT.

There is every indication of a revival of an ancient Egyptian industry, as a result of the enterprise of a small Egyptian firm, which is at present working a plant at Helouan, near Cairo, for the manufacture of dry colours and mixed paints. The erection of a larger and more up-to-date plant is contemplated and the firm hopes to be in a position to produce an output of 20,000 tons of various finished dry colours and 2,000 tons of ready mixed paints in a year of 300 days. The ingredients for the manufacture of these colours are taken from the same mines worked by the ancient Egyptians for the decoration of their temples, palaces and tombs, which have sufficiently proved both their longevity and quality.

NEW BRITISH STEEL COMBINE.

A steel combine with a capital approximating to $40,000,000 has been formed by the absorption by Messrs. Dorman, Long & Co., of Middlesbrough, of the concerns: Messrs. Bell Bros., Sir B. Samuelson & Co., the Carlton Iron Company, and the North-Eastern Steel Company. Messrs. Dorman, Long & Co. recently acquired large interests in the Kent coal field.

NICKEL STEEL IN MODERN BRIDGE BUILDING

Alloy steel has made possible greater advances in a few years than could have been achieved by any other means. A conspicuous example of this has been the adoption of nickel steel for bridge construction. Twenty years ago steel bridges had reached the practical limit of span and load capacity, because the low tensile strength of carbon steel would permit of no further advances.

Alloying the steel with three to five per cent. nickel has given the bridge designer a free hand. Nickel steel has extended its lattitude almost indefinitely, because so far the bridge designer has made only a limited use of nickel steel and we cannot even estimate at present what may be accomplished when it is used for the entire steel work of the modern bridge. Nickel steel has made the long span of the modern bridge economically possible. It permits bridges to be erected where such projects could not have been undertaken with weaker and heavier materials and its use will make possible bridges which hitherto would not have been considered practical at all. Its higher tensile strength in proportion to its weight as compared with carbon steel, also permits it to compete directly with the latter, owing to the reduced transportion and erection costs of nickel steel, as brought out in detail in the following article.

Although nickel steel was made commercially as early as 1885 its use at first was confined to armor plate and ordnance forgings. It was talked of for bridge construction before 1900 but it remained for Mr. Gustav Lindenthal, the well-known bridge engineer, to take the first practical steps in 1902 toward its utilization for this purpose. He was engaged at that time in the construction of the Blackwell's Island or Queensboro Bridge and arranged for some preliminary tests of nickel steel eye-bars for this bridge. His report on these eye-bars was favorable and he recommended the use of nickel steel. As described below, his recommendations were finally adopted and this bridge was the first to contain nickel steel.

At the time nickel steel made its debut, wrought iron had given way to carbon steel for structural purposes, and although this had involved an immense economy of material due to the greater strength of the latter, the material then available did not possess very remarkable mechanical properties. Thus it was usual at that time to specify medium carbon steel for bridge members, plates, shapes and eye-bars to have the following properties:

Yield point, min	30,000-35,000 psi	
Ultimate strength, min	60,000-70,000 psi	
Elongation in 8″	1,400,000 T.S.	1,500,000 T.S.
	To	%

(T.S. for Tensile Strength)

and to design for maximum unit stress (in tension) of from 10,000 to 16,000 psi.

The properties of nickel steel which made it appear attractive to bridge engineers at that time were its higher elastic limit and tensile strength. Thus as compared with the carbon steel noted above nickel steel could be specified at that time to have the following properties:—

Minimum Elastic Limit	50,000 lbs. per sq. in.
Tensile Strength	85-100,000 lbs, per sq. in.
Elongation in 8 inches	1,600,000 T.S.

Exhaustive Investigation Favored Nickel Steel

Attracted by the possibilities offered by a steel, which, although possessing greater strength and hardness also retained the ductility of the softer carbon steel, Mr. Lindenthal undertook his experiments with nickel steel eye-bars as described above. At the same time The International Nickel Company engaged Mr. J. A. L. Waddell, another well-known consulting bridge engineer, to make a general study of the suitability of nickel steel for bridge construction. Mr. Waddell thereupon organized a series of tests on special material produced by the Carnegie Steel Company, covering the properties of this steel, in the usual forms of plates, shapes, rivets and eye-bars, its susceptibility to fabrication by usual methods and equipment, its resistance to corrosion, etc. The results of this investigation were presented in a paper before the American Society of Civil Engineers in 1908, entitled "Nickel Steel for Bridges," his final brief summary of his conclusions stating "Summarizing the results of this entire investigation of nickel steel for bridges, it is evident that nickel steel is in every way fitted for bridge construction in that it is strong and tough, workable and reliable; moreover its adoption would effect a decided economy."

Now Entering Age of Alloy Steels for Bridges

The result of this investigation as well as of Mr. Lindenthal's tests awakened a great deal of interest in the subject and to them and their pioneer work is undoubtedly due the subsequent use of nickel steel in bridges described in more detail below, but particularly in the Blackwell's Island, Manhattan and Quebec bridges.

Since that time much more practical knowledge has been obtained of the use of nickel steel for this purpose and much discussion of the subject heard and it is encouraging that the verdict is almost universal among competent bridge engineers that nickel or other alloy steels must become an ever more prominent feature in long span bridge construction. Just recently in an address before the Society of Civil Engineers (delivered on January 19, 1923) Dr. G. K. Burgess, the well-known metallurgist and Chief of the Metallurgical Division of the Bureau of Standards, stated with reference to bridge building . . . "We are living in an epoch intermediate between the low carbon and the alloy steel periods" suggesting the increasing thought and trend toward the use of alloy and nickel steel for structural purposes.

A brief description of the prominent instances of bridge construction in which nickel steel has been used will be of interest.

The Queensboro or Blackwell's Island Bridge

This is the first bridge in which the use of nickel steel is recorded. It connects the Borough of Queens with that of Manhattan at 59th Street, across the East River, and consists of a double cantilever structure without suspended spans. The two cantilever spans are 1182 feet and 984 feet in width.

This bridge was built by the New York Department of Bridges under the supervision of Mr. Gustav Lindenthal, Commissioner, to whom credit is due for introducing the use of nickel steel for bridge construction. The superstructure contract was let to the Pennsylvania Steel Co. in 1903 and was completed in 1908.

Approximately 6,000 tons of nickel steel were used only in the tension members of this bridge in the form of eye-bars and pins.

The maximum tensional unit stresses allowed (dead load and regular live load) were 20,000 psi for the regular structural carbon steel and 30,000 psi for the nickel steel eye-bars, an increase of 50% which may be compared with the specified elastic limits; namely, 30,000 psi and 48,000 psi respectively.

Thus the increase in allowable unit stress for the nickel steel was proportionately slightly less than the increased elastic limit specified. It may be noted that the "quality factor" of the nickel steel; namely, the product of elongation in 8 inches into the ultimate strength; was specified higher than for carbon steel, namely 1,600,000 as against 1,500,000.

The New Quebec Bridge

This bridge was designed and erected by the St. Lawrence Bridge Company, the contract being awarded in 1911. It has a cantilever span of 1,800 feet with 675 feet suspended. The fabrication of the superstructure was begun in 1913 and the bridge completed in 1917.

About 16,000 tons of 3½ per cent. nickel steel were used in the superstructure, chiefly in the cantilever arms and tension members, much of which was in the form of eye-bars. This was specified to have a minimum elastic limit of 50,000 psi for plates and shapes and 55,000 psi for unannealed eye-bar flats.

The design allowed maximum primary unit stresses in carbon steel eye-bars of 20,000 psi and of 40% in excess of this for the nickel steel eye-bars. This ratio was maintained in all the design work of the bridge for tension members, an excess unit stress of 26% being allowed for nickel steel compression members. The material was furnished largely by the Carnegie Steel Company—Abstracted from article by P. D. Merica, in "Inco," Vol. IV, No. 1, published by International Nickel Co.

New Books Reviewed

"ORGANIC SYNTHESES" (Volume 11).

By James B. Conant. John Wiley & Sons, New York Price, $1.50.

Conditions have changed in America since the time when chemists were able to buy all their requirements in organic chemicals from German houses at a reasonable price. For several good reasons, the production of these chemicals in America has been a necessity. Much research work has been done and experience gained, and this series is an attempt to place on record methods of manufacture for a variety of organic chemicals now made by chemists in the United States. The most convenient method of preparing from one-half to five-pound lots is detailed; but these methods are quite frequently suited to larger work, if required. The chemicals selected are those that were needed in various research laboratories, and are not related in any other way.

This little book is very practical, in the sense that the methods and details given are the direct result of very considerable study and experience in every case. Students and chemists should be able to follow instructions easily and secure good yields.

"Constants and Conversion Factors"

The Editorial Office of International Critical Tables has prepared for use by the co-operating experts who will assemble the various classes of data for the tables, a list of definitions and approved values of general constants of nature, units of measurement, and conversion factors. This list has been printed in the form of a small pamphlet and will probably be found useful by chemists, physicists, and engineers as a convenient and handy source of reference for the above quantities and their logarithms. Copies of this pamphlet can be secured for 25c. each from the International Critical Tables, National Research Council, Washington, D.C.

Liquid Fuels, "Chimie et Industrie," Paris, France, 49 Rue des Mathurins. Price to non-Members of the French Society, 100 Francs

As a special number, issued in May, 1923, "Chimie & Industrie" has gathered a remarkable series of articles on all phases of liquid fuels used for power generation. Some 890 pages of illustration, description, data and discussion are presented, constituting everything presented at the International Congress of Applied Chemistry, at Marseilles, in October, 1922. This is a really exhaustive review of subjects. Representative chemists and engineers have contributed to this work, and the volume will be of special interest to those engaged in the automotive and oil industries in Canada and the United States.

Mining and Metallurgy in British Columbia

(Special Correspondence to Canadian Chemistry and Metallurgy.)

British Columbia Mines Resume Dividend Payments

One of the most satisfactory signs, at any rate from the investor's point of view, of the healthy state of the mining industry of British Columbia is that the mines are getting back to a dividend-paying basis. The important dividends for the second quarter of the year were the Premier Gold Mining Company, $400,000; the Howe Sound Company, $199,208; the Crow's Nest Pass Coal Company, $93,172.50; and the Silversmith Mines, $50,000. Silversmith Mines, although the smallest dividend of those mentioned, paid the highest dividend rate, the issued capital of the company being only $375,000, and the dividend rate, therefore, is 53.33 per cent. per annum. The Premier Gold Mining Company's dividend shows a decrease of $100,000, compared with the previous quarter, a decrease that is to be accounted for by the falling off in the tenor of the ore as depth is reached and the high-value secondary silver minerals drop out. This is compensated for, to some extent, at any rate, by the ore bodies increasing in size. The Howe Sound Company is the holding company for the Britannia Mining & Smelting Company, in British Columbia, and for the El Potosi and the Calera companies, in Mexico. This is the first dividend that the company has paid since December, 1920, when the Britannia company stopped productive mining on account of the low price of copper. Subsequently the mill was destroyed by fire and some eighty buildings by flood. Despite these disasters, the company continued to develop its mines, opened up an entirely new mine, the Victoria, and built a new mill, which embraces all the latest devices in the art of ore dressing. The mill was put into operation in February last, and, as a result—or partly as a result, for in fairness it should be stated that the Mexican companies have distributed their quota—a dividend at the rate of twenty per cent. per year was paid at the end of June. Financially the company is in the strongest position of any mining concern in the province, having assets amounting to more than $19,000,000 and $3,000,000 in readily negotiable securities, mainly government bonds. The Crow's Nest company's dividend amounted to a rate of only six per cent. per annum, none too large for an old-standing mining investment, particularly when the present unsatisfactory condition of coal mining labor is taken into consideration. The company is to be congratulated, however, as it is the only coal mining concern in the province that is on the dividend-paying list.

Valuable Ore Body Discovered at Iva Fern Mine, West Kootenay

The Standard-Silver-Lead Mining Company has run into a wonderful body of ore at the Iva Fern mine, on Cultrus Creek, at the foot of Kootenay Lake. The company has been searching for a mine since 1918, when it became evident that the life of the Standard mine, at Silverton, which had paid dividends amounting to $2,700,000, was drawing to a close, as a big producer. The company's engineers have examined properties in many parts of British Columbia and as far afield as Mexico, in the hope of discovering another big producer, but up till recently the efforts have been futile. In the fall of 1921 the company took a four-years option on the Iva Fern mine. The Consolidated Mining & Smelting Company previously had had an option on this property, and had spent some $30,000 on development, equipment, and road construction, but a payment of $22,500 fell due at a time when, owing to the depressed state of the base metal market, the company did not see its way to make the investment, so the bond was relinquished. The Consolidated company had stripped a promising vein on the surface, and was driving a tunnel to explore the vein at a depth of 200

feet. On the surface the vein was well mineralized with argentiferous galena and bornite and had a maximum width of forty feet. The Standard company continued the tunnel, and, some months ago, cut a four-foot vein, containing two feet of almost clean lead-zinc sulphide. Thinking that this was the vein that had been stripped on the surface, a drift was started to the north, to get under the surface showing. The drift was run for forty feet, but as the vein did not widen a re-measurement was made, from which it was concluded that the vein was not the objective of the tunnel, which, it was thought, had not been driven far enough to cut it. The tunnel was continued, and some three months ago cut an eight-foot vein, in which, however, there was no ore. A drift was started to the north, and, after it had been driven for thirty-five feet, it ran into a splendid body of ore, assaying twenty per cent. of lead, three per cent. of copper, and twelve ounces of silver per ton. This drift now has been driven for eighty feet in ore, and at the present face the vein shows four feet of high-grade shipping ore and four feet of milling ore. It has been demonstrated that the shoot of ore is at least eighty feet in length, and there is every indication that it will prove to be a good deal longer. The discovery is thought to be the most important one that has been made in West Kootenay for many years.

The Rio Tinto mine, on the Salmon River, in the Nelson mining division, has been sold to a United States syndicate for $60,000.

H. H. Armstead, who took an option on the Utica mine last year, is starting to develop the property. The Utica has produced some of the richest silver ore that has been found in the Kootenay.

A Vancouver syndicate has bonded the Noble Five mine, in the heart of the Slocan, and will re-open it at once. This property has been idle since 1920, when it was closed on account of the general depression in the lead mining industry. A new mill, modern in every way, was erected in 1919, a few shipments of lead concentrate were made to Trail, and a considerable bulk of zinc concentrate was stored. The latter was cleaned and shipped to Trail when the new zinc schedule went into force.

The extension of the ore-shoot at the Cork-Province mine has been re-located on the 400-foot level, and the ore is said to be as good as that which was mined in the upper workings and from which large profits were made.

The Florence mine, at Ainsworth is crushing 200 tons of ore per day and making steady shipments to the Bunker Hill and Sullivan smelter, at Kellogg. Work on the high-tension line to connect the mine with the Nelson city power system is being pushed forward, and as soon as it is completed the capacity of the mill will be doubled, and then the Florence probably will be the biggest independent shipper of lead concentrate in the province.

Tidewater Company Milling 200 Tons Copper Daily

The Tidewater Copper Company has installed a 300-horse-power Diesel engine, and now is milling 200 tons of copper ore per day and shipping 600 tons of concentrate, running from 35 to 40 per cent. of copper per month to the Tacoma smelter. For long the company has been handicapped by the intermittent nature of its water power plant, but from now on it is expected that a steady stream of concentrate will be sent to the Tacoma smelter.

Development at Quatsino Sound

The Consolidated Mining & Smelting Company has between twenty and thirty men at development work on the Old Sport mine, at Quatsino Sound. A large body of ore has been developed, and, it is understood, work on the construction of a 350-ton concentrator will be commenced as soon as the Sullivan mine concentrator is finished and the mill at Trail, now treating Sullivan ore, has been re-modeled to treat the ores from the Company's Rossland mines.

Large Limestone Contract

The Pacific Lime Company, which owns extensive limestone deposits on Texada Island, has contracted to supply the Granby company with 25,000 tons of broken limestone within the next twelve months, and the company is adding new crushing equipment to enable it to fill the order. The company employs some 150 men, and, besides the crude rock, either crushed or in lump, supplies the building trade with both slaked and unslaked lime.

Increasing Interest in Portland Canal District

A great deal of interest is being shown in the Portland Canal district by British, eastern Canadian and United States capitalists, and a number of prominent engineer and financial men are in that field at the time of writing. H. S. Denny and C. S. Bates, of London, are making a thorough examination of the Bush, Daly-Alaska, and Forty-nine groups, which Mr. Denny has under option, and Samuel Silverman, of New York, who interested Mr. Denny in some of the properties also is at Stewart. Malcolm Stobie and F. H. Phippan, of Toronto, and W. D. Wilson, of Hamilton, accompanied by R. B. Lamb, a New York mining engineer, in an advisory capacity are looking over a number of properties in the district. J. T. Crabbs, president, and H. S. Munroe, general manager for the Granby company, and Frank Probert, professor of mining at the University of California, have made an inspection of the Granby company's properties throughout the province.

Timmins Brothers, of Hollinger fame, have relinquished their option on the Engineer Mine, at Atlin, and the mine has been bonded by a New York syndicate. The recent case against the owners of the mine was dismissed.

Railway Developments

There is great activity along the Grand Trunk Pacific Railway, and a number of well-equipped parties have gone into the little-known region in the northern part of the province. Considerable interest is being shown, too, in the movements of four surveying parties that the Canadian Pacific Railway has in the northern part of the province, and, although no official information is obtainable, the general opinion is that the company purposes to extend the Edmonton and Dunvegan branch to the coast, making a terminus at Stewart, and at the same time connecting with its system in the southern part of the Province, probably at Ashcroft.

NEW DEMAND FOR BRITISH DYES.

Extensive new plant is being installed at the Huddersfield works of the British Dyestuffs Corporation to meet the growing demand created by the situation in the Ruhr Valley, and by the strengthening of public confidence in British acids, intermediates and dyestuffs. Inquiries are being received from Belgium and even from Germany for acids.

The French action in the Ruhr is gradually convincing the color users in Great Britain that in their own interests the establishment of a strong British dyestuff industry is essential, and the same reasoning applies to other branches of the chemical industry, such as fine chemicals.

A NEW SOFT SOAP.

French Patent No. 514,294, gives the process for the manufacture of a new soft soap. The soap obtained in the ordinary manner, by saponifying olein with potash lye, is mixed with a solution of waterglass; the quantity used is, preferably, to every 400 kg. soap 146 kg. waterglass of 36 degrees Bé., diluted with 140 kg. water. After thoroughly mixing, the soap is neutralized by adding muriatic acid in drops. For this purpose, about 40 kg. muriatic acid, of 22 degrees Bé., diluted with 75 kg. water, are needed. The white soap obtained is suitable especially for cleaning and bleaching linen and other textiles, etc.

World Wide Chemical News

(Special Correspondence to Canadian Chemistry and Metallurgy from Our London Representative)

Work at the experimental station of the Building Research Board (England) has resulted in the production of a hydraulic cement by the use of spent shale from the Scottish oilfields. The cement has a tensile strength at three months' age, greater than that required for Portland cement by the British Engineering Standards Association specification. The cement is of a pleasant light red color, and is much harder than ordinary Portland cement. The spent shale is a waste product of the oil industry, and the new discovery if adaptable to Canadian conditions should prove of interest to those now contemplating the development of the shale oil deposits of New Brunswick and Nova Scotia.

German Notes

An arrangement has been made under which the Upper Silesian Coke Works and Chemical Works and the Saccharin-Fabrik, A. G. vorm. Fahlberg, List & Co. will work in conjunction without amalgamation.

Despite temporary depressions, the German potash industry shows remarkable progress. Last year's sales of potash products surpassed the highest pre-war figure (1913) very considerably, totalling 1,295,544 metric tons as against 921,181 during 1921 and 1,110,369 tons during 1913. Foreign sales last year represented 25.6% of the total output.

Production has been stopped at twenty potash works and eight mines which were regarded as unprofitable, out of a total of 211 potash and seven special works belonging to the syndicate. The Prussian Government has issued three potash loans, for which the output of the State mines serves as a guarantee;—the bonds have the value of a certain amount of potash at current prices. Not being affected by the fluctuations of the German exchange they are regarded as a "constant value" and were so favorably received that every loan was fully subscribed within two days.

The Deutwche Kaliwerke have acquired the majority of the Kalk-Magnesia Gesellschaft, Hamburg, and thus gain the control of the production of a lime-magnesia fertilizer, in which agricultural circles show considerable interest.

The output of nitrate fertilizers is now much reduced and is carried on under severe difficulties owing to the lack of fuel. The great Oppau plant came to a standstill as far back as May last. The Rhenania Verein Chemischer Fabriken at Aachen (Aix-la-Chapelle) are enlarging their works at Honningen and Heilbroon, both of which have full order books. There are difficulties in connection with Rhenania phosphate production owing to the scarcity and dearness of the raw material; foreign phosphate has therefore been imported. Large stocks have accumulated at the company's works in the occupied area, but output at the Stolberg and Honningen factories has been restricted. The phosphate factory at Porz has been closed altogether.

The Gesellschaft für Chemische Industrie (formerly Scheidemandel), which has a number of branches abroad, is said to have come to a large extent under Dutch influence lately. Some time ago it extended its foreign organization through an arrangement with the Liebig concern. Now it is credited with the intention of converting its foreign branches into a Dutch company. Several German chemical firms are extending their export organizations and some of them are establishing branches abroad. The Chemische Fabrik Heyden and the Lingner Werke propose to start factories in the United States.

Political and economic conditions still conduce to the formation of trusts, and amalgamations in the oil industry show rapid development. Two large groups have already been formed—namely the Deutsche Petroleum Gesellschaft-Rütgerswerke and the Gesellschaft für Petroleum-Industrie-Riebeck Montanwerke. Now, the Deutsche Erdol Gesellschaft is acquiring one of the most important German coal mines, the Gewerkschaft Graf Bismark. These pits yield a coal which is especially suitable for the extraction of by-products, as it is highly bituminous; the output is about 1.6 million tons annually.

Engineers boring for petroleum near Dannenberg, in the province of Hannover, have struck a bed of potash salts several hundred yards thick. The deposit, which is stated to be of good quality, is to be exploited without delay.

Italy to Develop Lignite Deposits

The Italian Government has decided to utilize on an extensive scale the lignite deposits found in vast quantities in the Perugian mines. The plant required will be installed at Bastardo, in the Commune of Giano dell'Umbria (Perugia), and will work in connection with the electrical installations in Tuscany and Perugia. It will include six gas-producers, capable of dealing with 54 tons of natural lignite per hour; apparatus for refining the gas and recovering the tar and the nitrogen in the form of ammonium sulphate; gas-fired boilers with a capacity of about 230,000 lbs. of steam at 300-lb. pressure and 350° C.; and three turbo-alternators of 5,000 kw. each, one to be in reserve.

Another project promoted by the Banca Tecnica Industriale, of Bologna, contemplates the utilization annually of a minimum quantity of 140,000 tons of lignite.

Italo-American Sulphur Agreement

The recent agreement between the American and Italian (Sicily) producers of sulphur is to last for a number of years, but is subject to cancellation on six months' notice being given. It allocates the Mediterranean market to Italian interests, to whom it practically guarantees the sale of 250,000 tons of sulphur annually. The immediate result of this agreement has been an increase in the price of sulphur by some four to eight shillings per ton delivered at a European port. At the present time the delivered price of American sulphur in the United Kingdom is approximately $21, and in Spain and France about $22.50, and Sicilian prices are on a parity.

The Roumanian petroleum industry is still restricted by various difficulties arising out of the war. In 1913 production reached 1,847,875 tons, but the figure for last year only amounted to 1,137,184 tons, a decrease also from the 1921 total of 1,168,414 tons.

Malayan Rubber Exports Increase

The gross exports of rubber from British Malaya during the first six months of this year reached 129,168 tons, and net shipments after deduction of imports amounted to 100,247 tons. The corresponding totals for the first half of 1922 were 117,105 and 104,229 tons respectively.

Developing Tasmanian Shale Oil Deposits

Several companies and syndicates are now at work in Tasmania on the exploitation of the oil shale deposits of that state, among them the Southern Cross Motor Fuels, Limited, which—after experimenting with a retort having a capacity of thirty tons per day—has decided to put in fourteen additional retorts. An immediate beginning will be made with nine, and these will treat three hundred tons of shale per day, yielding fifteen thousand gallons of oil.

A rich discovery of tin is reported from the north-east coast of Tasmania, at the foot of Mount Cameron, and a company has been formed to explore the property.

Tasmania Carbide Company Urges Embargo

The Carbide Company of Tasmania is still pressing the Federal Government for the imposition of an embargo on the importation of carbide into Australia for a further period of twelve months. There is every indication, however, that the Government will not accede to the request, maintaining that the present customs duty of £7 10s. a ton, and an extra anti-dumping duty of £1 10s. against carbide from Norway, should be sufficient protection for the Tasmanian industry.

Industry and Trade

Industrial Developments---Trade and Company News---Financial Notes---Patents Market Review and Prices

INDUSTRIAL DEVELOPMENTS.

Hamilton, Ont.—The Canadian Westinghouse Co. is constructing a $200,000 unit addition to their plant here. This is the first of a series of buildings, the total value of which will amount to $1,500,000.

Sudbury, Ont.—A new industry is to be established in the Sudbury and Algoma districts, where 1,046 square miles of timber have been acquired by the Continental Wood Products Co., Ltd., who will erect a craft pulp mill at Alsace, at a minimum cost of $1,500,000.

The Toronto Paper Mills Corporation has recently taken over the Hartje Bros. Paper Co.'s mill, and is expending $50,000 upon repairs and new machinery. The capacity of the mill will be 70 tons daily.

Calgary, Alta.—The new 3,500-barrel refinery of the Imperial Oil Co., here, costing over $2,000,000, will be in operation by September of this year.

South Porcupine, Ont.—The ten-stamp mill of the Davidson Consolidated Gold Mines was completely destroyed by fire on July 9th, with a loss of approximately $10,000.

Iroquois Falls, Ont.—The total output of the Abitibi Pulp and Paper Co., during June, was the highest in the history of the Company, being 12,270 tons, or an average of nearly 472 tons per day.

Timmins, Ont.—During the month of June the McIntyre-Porcupine treated 28,000 tons of ore.

Toronto.—A new waxed paper mill is being constructed by Bradshaw's, Ltd., and will be ready for occupation by September of this year.

The Wm. R. Warner & Co., Ltd., of New York, are opening a plant at 727 King St. E., where they will manufaoture a complete line of pharmaceutical preparations.

Montreal, P.Q.—F. W. Horner, Ltd., pharmaceutical manufacturers, have moved into new offices, an addition to their plant which doubles their capacity, and are installing new machinery.

The Laura Secord Confectioners, Ltd., are constructing a four-storey addition to their factory. This will double the plant's capacity and number of employees.

Fort McMurray, Alta.—A 250-barrel oil refinery is to be built here this summer by the Athabasca Petroleum Products Co., Ltd., for the extraction of petroleum products from the Athabasca oil sands.

Port Coquitlam, B.C.—In April, the Gregory Tire & Rubber Co. increased their output of tires and tubes by 300.

Iroquois Falls, Ont.—The Abitibi Power & Paper Co., Ltd., are building a two-storey addition to the wood room of their plant here.

Quebec, P.Q.—Between Chicoutimi and the Grand Discharge of the Saguenay vast construction and development works are at present in progress. These works are said to represent a total capital of forty millions of dollars, and are giving employment to nearly 2,000 workers.

Three Rivers, P.Q.—A plant has been purchased here by the George Christie Co., Ltd., of Glasgow, Scotland, for the manufacture of wire cloth for use in paper mills, and also dryer felt for paper machines.

Welland, Ont.—Another large appropriation has been made by the Federal Government for the construction of the Welland Canal, the sum amounting to $11,800,000, to cover operations for the current year. About $34,000,000 has been expended on the canal so far, and it is expected that the total cost will be approximately $80,000,000. It is anticipated that the canal will be completed in 1927.

Kelowna, B.C.—Canneries in the Okanagan Valley will pay $17 a ton for canning tomatoes this year. About 800 acres of tomatoes will be planted this year in the Kelowna district alone. Two canneries will operate here this year, one at Kamloops and three at Keremeos. In addition a large quantity of tomatoes will be sent to the coast for packing.

Penticton, B.C.—The Pacific Berry Growers are making preparations for a considerable extension to their present plant. It is their intention to install a small cannery. The output will not exceed 30,000 cases of canned vegetables this summer, although the capacity of the plant will be considerably above this figure.

Victoria, B.C.—Arrangements are reported to have been completed between the B. C. Liquor Control Board and 300 loganberry growers of the Saanich district for the establishment of a wine industry here. The wine will be made from the loganberries which, as a result of tests conducted during the past two years, by liquor department officials proves to be of a superior quality. The first output under the arrangement will be 5,000 gallons. Producers will get about $2 a gallon for their product.

Lethbridge, Alta.—The proposed petroleum distilling plant, mentioned in our July issue, is now being erected by the Dominion Refineries, Ltd., here at a cost of $100,000, and will, when in operation, be able to handle 500 barrels of crude oil daily. The U.S. Petroleum Co., of Montana, in which the company has a controlling interest, will supply the refinery at Lethbridge with crude oil.

Toronto.—The latest American company to establish a branch factory in Canada is the Wayne Pump & Tank Co., which has leased a building here. Machinery for manufacturing purposes is beng installed. The firm heretofore had only maintained a selling office in Toronto.

Ottawa, Ont.—The development of the flour milling industry in Canada in the last fifty years is indicated in a return just completed, which shows that in that time the capital invested in flour mills has increased from $10,000,000 to $62,000,000, the consumption of raw material from $32,000,000 to $165,000,000 and the value of products from $39,000,000 to $195,000,000. The export of wheat flour from Canada in the same period has increased from $1,600,000 to $54,478,000.

Toronto.—It is understood that the Nujol Laboratories, of Bayonne, N.J., have leased a portion of a building here for the establishment of a Canadian branch. The Company, which has hitherto handled its Canadian business from its other plants, will not manufacture from the raw material, but will bottle and pack the product from the bulk.

Beachville, Ont.—Construction has commenced here of a cement plant for the Toronto Cement Corp., which will have a production of 4,500 barrels of cement per day, or about one and a quarter million barrels a year.

Winnipeg, Man.—The Lake of the Woods Milling Co. will spend about a quarter of a million dollars this season on the betterment of their plants in Western Canada.

Victoria, B.C.—Tests of ceramic clay resources in British Columbia are being planned this summer by the B. C. Government. The tests will be made under the auspices of the Department of Education and the Department of Industries. There are many varieties of clays in British Columbia and some are reported to be particularly suited to the manufacture of high-class pottery ware.

Smooth Rock Falls, Ont.—The Mattagami Pulp & Paper Co., Ltd., is now operating at full capacity, having a daily output of 150 tons of unbleached sulphite pulp.

Sarnia, Ont.—The Dominion Alloy Steel Corp. have purchased 250 acres of land on the St. Clair River, and are going ahead with plans for the construction of the first unit of a plant, to have an estimated capacity of from 30,000 to 50,000 tons of steel per annum.

Montreal.—A new Canadian Corporation, to be known as the Paramount Rubber Company, has been formed to handle the Canadian and British trade of the recently amalgamated Paramount Rubber Co., of Little Falls, N.J., and the Hodgman Rubber Co., of Tuckaboe, N.Y.

Brampton, Ont.—The T. Eaton Co., Ltd., have purchased the assets of the Hercules Rubber Co., and intend making additions to the present plant, which will double the capacity.

Ottawa, Ont.—Exports of paper manufactured in Canada during the month of June reached a total value of $7,859,684, an advance of over a million dollars compared with records of June, 1922.

Sault Ste. Marie, Ont.—The Canadian Pacific Railway has placed an order with the Algoma Steel Corporation for 35,000 tons of rails. This order, it is understood, will keep the plant busy until the end of September.

Asbestos, P.Q.—Work is to be commenced this month on the new manufacturing plant of the Johns-Manville Co. Some 200 hands will be employed by this new industry. For some time, consideration has been given to the feasibility of manufaoturing asbestos produots in Canada, close to the source of supply, as hitherto the raw product has been shipped to the United States for manufacture.

Brantford, Ont.—It is reported that the Dayton Malleable Iron Co., one of the largest foundry plants in the United States, has purchased Pratt & Letchford, of this city, and will manufaoture castings for the automobile trade.

St. John, N.B.—The Atlantic Pulpwood Co., Ltd., was recently incorporated here, for the purpose of carrying on business in pulpwood and timber lines. The Company proposed to handle cargo as well as rail shipment wood, and has its head office in St. John, and a branch office at Annapolis Royal.

Sault Ste. Marie, Ont.—The L'Air Liquide Society, with headquarters at Paris, France, are contemplating the establishment of a $500,000 plant here, for the manufacture of oxygen and acetylene gas. The company has already several plants in Canada, with Canadian head office at Montreal. They will locate here if a sufficient market can be secured for their output, which is 100,000 cubic feet of oxygen and acetylene combined, per month.

IN THE PULP AND PAPER INDUSTRY.

The proposed embargo on unmanufactured pulpwood from Canada is causing some stir among Canadian dealers and a very great concern to American paper and pulp manufacturers who are dependent on Canadian wood, or who prefer to use up Canadian supplies rather than their own. Some of them go so far as to say that such an embargo would practically kill their "billion dollar industry!" The Canadian government has signified its intention of appointing a commission to investigate the matter, and American manufacturers will probably be given a chance to give their side of the question. In the meantime, considerable increases in exports of pulpwood show that they are stocking up.

Exports of pulp and paper in June were valued at $12,368,456. This is an increase of $809,772 over the previous month, and is the second highest total for the year. Exports of newsprint were greater than in June, 1922, by 127,464 cwt. Book paper showed a big increase, and total pulp exports were greater by 98,271 cwt.

Incorporations.

Letters patent incorporating the "Belgo-Canadian Paper Company, Limited," have been issued. The total capital stock is given as $13,500,000, divided into 135,000 shares of $100 each and the head office of the company is to be in Montreal, Canada Cement Building.

The Atlantic Pulpwood Company, Limited, was recently incorporated under the Companies' Act of the Province of New Brunswick, for the purpose of carrying on business in pulpwood and timber.

Forestry Rangers' School.

By decision of Hon. Honore Mercier, Minister of Lands and Forests, Quebec., the Forest Rangers' School, which was created at the last session of the Legislature, will open on the 11th of September, next, at the Berthierville government nursery, under the direction of Henry Roy, forestry engineer. The object in view is to form experts in dealing with forest fires, and generally with forest protection, and the school to a certain extent will be preliminary to the forestry school now operated under the auspices of Laval University in Quebec. The courses will be given in French and English.

Timber-cutting rights on 1,040 square miles of territory in the Sudbury and Algoma districts, have been let to the Continental Wood Products Company, Limited, of Montreal, and Elsas, Ont., on condition that they undertake to have a $1,500,000 pulp mill in operation by June 1, 1925, and they may later be called upon to construct a paper mill for the manufacture of kraft paper.

P. T. Dodge, president of the International Paper Co., the largest paper producers in the world, and owners of a large newsprint mill at Three-Rivers, Quebec, states that the earnings of the company are satisfactory. The consumption of newsprint shows no signs of diminution, and demand keeps up at the peak. Beginning with March, the earnings of the company available for dividends showed considerable improvement, and that month's statement showed about $415,000 available for the capital stock. There has been a slight falling off since then on account of wage advances, but earnings are close to the March figure. The various mills of the company are operating above normal capacity and there is no reason to believe they cannot continue at this rate.

Forest Products will have a prominent place in the exhibit of the Dominion Government at the British Empire Exhibition. This portion of the exhibit will be in charge of W. B. Stokes, of the Forest Products Laboratories of Canada.

Wartime Control upheld by Privy Council.

The appeal in the case of the Fort Frances Pulp & Paper Co., Ltd., vs. the Manitoba Free Press Co., Ltd., and others, in connection with a claim to recover money paid in excess of prices fixed by the Paper Control Board under the War Measures Act of 1914, was dismissed by the Privy Council on July 25th. The validity of wartime control by the Dominion was upheld.

Bathurst Company Wins Decision in Compensation Case.

The New Brunswick Supreme Court has rendered a verdict in favor of the Bathurst Co., Ltd., of Bathurst, N.B., in the action brought against that company by the New Brunswick Workmen's Compensation Board. The case, which was regarded as of outstanding importance, involved a claim of $62,000, being two yearly levies of $31,000. The board had levied on the company, which refused to pay the levy. The board instituted court proceedings and the first verdict was in their favor. The board also won on appeal. The company then started action against the board and also appealed from the previous verdicts to the Supreme Court of the Province. It is likely that the case will be carried to the Privy Council.

The production of newsprint in Canada during the first six months of 1923, was 619,802 tons, a total hitherto unapproached for any similar period. The corresponding figures for 1922, 1921 and 1920, were 516,506, 373,988, and 443,512 tons, respectively.

NON-METALLIC MINERALS INDUSTRY OF NOVA SCOTIA SHOWS PROGRESS.

There is much valuable information in the "Report of the Mines 1922," Province of Nova Scotia. This report deals with the mineral production of Nova Scotia for the year 1922. Coal is, of course, the chief item dealt with, and some 46 pages are devoted to a detailed report on the various mines. A total of 4,642,196 tons of coal were mined in 1922, which was a decline from the 1921 output by 700,000 tons, due to protracted strikes and to a falling off in demand during the first quarter of the year. It is interesting to note that a revival of the gold mining industry was apparent throughout the year. A total of 865½ ozs. was produced valued at $16,445. During the year work was started on a deposit of magnetite at Glencoe, Cape Breton, by the Dominion Iron and Steel Co. The deposit has an assay value of about 58% metallic iron. Sufficient work has not been done to prove the value of the deposit. An interesting discovery of radium was made about 10 miles north-east of Stewart Station, Upper Musquodoboit, which has been favorably reported upon by analysts. No work has so far been done on this deposit. From a chemical standpoint probably the most interesting mineral development in Nova Scotia is that of the Malogash Salt deposit, situated about seven miles from Malogash Station, on the Pictou and Oxford Branch of the Canadian National Railway. During the year a depth of 200 feet was reached. In the official government report on the mines by Thomas Beveridge, M.E., he states: "After a very careful study I find that this deposit contains at a low estimate some 25,000,000 tons of salt that could be mined." The present output is 40 tons per day, two shifts being run, with 25 men employed. The demand for the salt, especially in fish curing and packing uses, is increasing steadily.

The production of gypsum advanced during the year, 256,876 tons being produced. Production of limestone also showed a marked increase, 153,564 tons of limestone and dolomite being produced, and 3,659 tons of lime for fertilizer.

In the introduction to his report on the gypsum and other quarries of Nova Scotia, Mr. Beveridge writes as follows:

"In submitting my report on the quarries operating in the Province, my personal feeling is one of surprise, that more activity has not been shown in the development of the non-metallic minerals. This is a division of mineral resources that is of vast practical value and importance to Nova Scotia. It would be a commonplace, to remark on the richness of the Province in these materials and their excellent situation for their development. There are large deposits of readily marketable clay, also of sand that could be used for special purposes; slate suitable for the building trade is plentiful; while the granite deposits to be found in many parts are equal to any on the American Continent."

REPORT ON CANADA'S RESOURCES OF TITANIUM.

Titanium white, a new pigment of which the essential constituent is titanium dioxide, is now being made from the mineral ilmenite. This pigment, which is said to possess certain very desirable properties in a higher degree than any other similar material now on the market, is being produced commercially both in Norway and in the United States. It is sold under various trade names. such as kronos brand titanium white (Norwegian) and titanox (U. S.).

A report on Titanium, by A. H. A. Robinson, recently published by the Mines Branch. Department of Mines, Ottawa, discusses the manufacture, properties, and uses of this new pigment as well as those of other useful titanuim compounds, and describes in some detail the occurrence in Canada of large unexploited deposits of titanium ores that may in the future become of considerable industrial importance.

In the Province of Quebec, for instance, within 70 miles of Montreal and also within 90 miles of Quebec City. there are large bodies of ilmenite that are readily accessible, that can be cheaply mined, and that show every evidence of being capable of furnishing an output large enough to meet any probable demands for many years to come. In the past, occasional small shipments have been made from them for export to the United States, to be used in the manufacture of ferrotitanium, but the benefits to be derived from any possible export trade in the raw mineral would be small in comparison with those that would accrue from the establishment of a local titanium industry, such as the manufacture of titanium white, for which the conditions seem eminently favorable since the deposits are within easy distance of abundant supplies of hydro-electric energy and markets for finished products. If it is possible to make a commercial success of titanium industries in Norway and in the United States, there is no obvious reason why such an industry could not also be made a success in eastern Canada.

This report on titanium, which comprises 119 pages of text, may be obtained by application to the Director, Mines Branch, Department of Mines, Ottawa.

"LINK-BELT LIMITED," NEW NAME OF WELL KNOWN COMPANY.

The name of the Canadian Link-Belt Company, Limited, has been changed to Link-Belt Limited.

INCREASED NICKEL PRODUCTION.

One of the brightest features of the situation in the Canadian mining industry this summer is the resumption on a substantial scale of nickel mining, and the production for the year promises to show a handsome increment over last year's. The production of nickel in Canada was stimulated to an acute degree by insistent war-time demands and suffered inevitably at the conclusion of hostilities. A further blow to the industry was administered by the disarmament agreement, as the greater part of the output was utilized in battleship construction. Considerable research has of late been undertaken with a view to discovering peace-time industrial values of this mineral.

The growth of nickel production in Canada forms an interesting and somewhat remarkable branch of industrial history. In 1889, when Government records were first kept, the annual production was 830,477 pounds, with a value of $498,286. In 1895 the production had risen to 3,888,525 pounds and by 1900 to 7,080,227 pounds. There was an astonishing increase in the next decade, the output rising to 37,271,033 pounds by 1910. Production nearly doubled again in the next five-year period, amounting to 68,308,657 pounds in 1915.

War Demand Stimulated Production.

Under war-time demand a stimulated production was maintained up to the cessation of hostilities. Production in 1916 was 82,958,564 pounds; in 1917, 84,330,280 pounds; and 1918, the record year for the industry, 92,507,293 pounds. In the first post-war year, the output dropped by half, being 44,542,953 pounds. By 1920 it had slightly increased again, being 60,859,100 pounds. The year 1921 was a depressing one with an output of 12,859,100 pounds. Under a partial opening of plants in 1922 a substantial increase was recorded, and the year established a production of 31,217,300 pounds, worth $6,824,288. The record production value was achieved in 1918 when the output was worth $37,002,917.

This summer the British American Nickel Corporation is resuming operations at its mine and smelter at Murray, which plant has been closed down for over two years. The company has two furnaces with an ore capacity of 1,200 tons daily and a matte production of 35 tons per day, the ore being mined at Murray and the matte shipped to the refinery, Deschene Quebec. Seven hundred men will be employed. There is likewise to be an increase in production at the Mond Nickel Co.'s mines. The company has already doubled its output this year and is smelting between 35,000 and 40,000 tons of ore per month at the present time. Additions to the plant are also being made. The International Nickel Company is likewise showing greater activity, and will record an enhanced production at the end of the year.

These three companies prartically control Canada's nickel deposits. All are in the Sudbury district of Ontario, constituting together the world's richest known nickel area, which has made Canada the foremost nickel-producing country. Proven contents of nickel in the Sudbury districa are placed at 70,000,000 tons, with possible and probable reserves of another 80,000,000 tons.—C. P. R. Industrial Reports.

CANADIAN COBALT PRODUCTION.

During 1922 three smelters in Ontario treating ores and residues from the Cobalt district marketed cobalt oxide, metallic cobalt, cobalt sulphate, cobalt carbonate, cobalt hydroxide, separated oxide and stellite (an alloy used for high speed tool metal). The cobalt production of Canada in 1922 was 569,960 pounds, which, at $3.25 a pound, would be worth $1,852,370.

CHEMICAL EXPOSITION PLANS—INTERESTING FEATURES FOR EVERY CHEMICAL INDUSTRY.

A call for motion picture films to be shown at the 1923 Chemical Exposition when it is held this fall at the Grand Central Palace, New York, during the week of September 17th to 22nd, has been sent by the management to exhibitors. Films of a technical nature covering some phase of the chemical, chemical consuming, equipment, or allied industries are being procured.

Chemistry and the Radio.

An exhibit showing what chemicals have done in the development of the radio will be one of the educational features of the Chemical Exposition this year. Any exhibitor at the Exposition who manufactures products which in any way enter into the field of wireless telephony, will be permitted to place his products in this special radio exhibit. Not only the raw materials furnished by the chemical industry for the radio industry will be shown, but finished articles suitable for use in this field can be entered.

Exhibits For Tanning and Leather Industries.

Among the exhibits of interest to the tanner and leather finisher at the 1923 Chemical Exposition will be a display by the National Lime Association, representing a great majority of the big lime producers of the United States. All kinds of lime, its uses, old and new, packing, shipment, handling, including new adaptations for the tannery, will be demonstrated. Displays by the International Salt Company, the Avery Rock Salt Mining Company, and the Myles Salt Company, as well as the general exhibits of chemicals, tanning extracts, leather colors, dopes and special compounds recently developed, will be of particular interest to the tanner and finisher of leathers.

Universal Solvent.

Selenium oxychloride as the universal solvent, particularly as a carbon remover and anti-knock compound for internal combustion engines, will be demonstrated by the Bureau of Chemistry, Department of Agriculture, at the Exposition.

Of Interest to the Rubber Chemist.

A special appeal to their rubber compounding exhibits at the 1923 Chemical Exposition has been announced by the New Jersey Zinc Company, the Magnesia Talc Company, and the Southern Minerals Corporation, as well as the Union Sulphur Company and the Texas Gulf Sulphur Company. In addition to the general line of rubber chemicals and machinery which will be shown at the Exposition this year, it is expected that several new accelerators and compounding ingredients will be demonstrated.

Raw Materials For Toilet Goods.

Raw materials for the manufacture of toilet goods will be displayed in various forms. Essential oils, American made aromatic chemicals, talc, cold cream and cosmetic bases, tubes, bottles, jars, filling machinery and other raw materials of which steadily mounting quantities are being consumed in the United States each year in toilet articles, will be shown.

Exhibits of Instruments, Plant, Equipment, etc.

About fifty American manufacturers of fine precision instruments of various types all the way from high pressure gauges to ultrafine chemical balances, will show their goods at this year's Chemical Exposition, according to early estimates. More than an equal number of manufacturers of all kinds of chemical and allied plant equipment, such as centrifugals, screens, crushing machinery, pumps, acid-proof ware, valves gears, pipes, drying equipment, filter presses and the like, will show their goods.

The Glass Industry.

The glass industry will see its products from both ends of the manufacturing scale. Numerous displays of finished bottles, jars, carboys, laboratory equipment, and so forth, for the chemical consuming manufacturer, will be shown, in addition to the usual full line of chemical raw materials for the glass manufacturer.

Important Developments in the Insecticide Industry.

The rise of the boll weevil and its arch-enemy, calcium arsenate, during the last few years, has marked one of the biggest developments in practical chemistry of the insecticide industry. Within a few months after the pest had gotten a foothold in the cotton belt of the South, the effectiveness of calcium arsenate had been demonstrated, and several plants had made arrangements to take care of the demand by doubling their capacities. As a practical demonstration of the broad area covered by the insecticide and fungicide industries, a composite group of exhibits in this field has been planned tentatively for the 1923 Chemical Exposition.

Ceramic Men Will Be There.

The American Ceramic Society will hold its regular fall meeting this year in New York at the Grand Central Palace in conjunction with the Exposition of Chemical Industries.

DEVELOPING IRON ORE DEPOSIT ON ALGOMA CENTRAL.

A party of Chicago capitalists went up the Algoma Central Railway to visit ore properties near Mile 60, where it is expected they will spend $200,000 in proving the ore deposit with the idea of going ahead with extensive developments if that is warranted. Exploration work on the iron claims has been going on for some months, and it is understood that the findings have been very promising. If the deposit proves up as is expected it would go far towards making Sault Ste. Marie the iron and steel centre of Canada, and it would mean that Canadian mills would no longer be dependent on American ore.

CANADIAN IRON AND STEEL PRODUCTION.

The production of steel for Canada declined to 96,167 tons in June from the record of 104,079 tons for May. The output during June, 1922, was only about one-third of that for June, 1923.

The production of pig iron during June declined slightly from the high record of the previous month. The output was 99,239 gross tons, as compared with a record of 101,533 tons in May. The output in June was greater than the monthly average of 1918, when the highest annual record of recent years was established.

The production of ferro alloys declined slightly from 2,387 tons to 2,185 tons in June. The whole quantity in either case was ferro-silicon produced in electric furnaces for sale.

REPORTS RECEIVED.

Mellon Institute of Industrial Research of the University of Pittsburgh, 10th annual report.—This report outlines the work carried on at this institution. The Industrial Fellowships System, formulated by the late Dr. Robert Kennedy Duncan, and placed first in operation at the University of Kansas in 1907, was inaugurated at the University of Pittsburgh, March 1, 1911. The Mellon Institute is a centre for technical investigation in chemistry and allied subjects. Nearly every Canadian university has been represented among the Fellows who have studied at the Institute.

ONTARIO MINING DEVELOPMENTS.

The main features of the annual report of the Argonaut Gold, Limited, were the rich quality of the ore found in the new ore body at the 500 foot level, and the fact tbat the company has entered upon its productive career with a clean balance sheet as far as obligations to the public are concerned. Tbe ore at the 350 foot level averages $21 to the ton, and at the 500 foot level $24.50. Diamond drilling indicates the presence of another ore body 180 feet below the latter, which gives averages of around $20 to the ton.

The quarterly report of the Dome Mines Co. for tbe period ended June 30 last shows earnings at a rate substantially lower than tbose of last year. This is attributed to the fact that during April and a portion of May the operations at the mine were severely bandicapped by shortage of power. As a consequence the April earnings were very substantially reduced and May revenues, although higher, were under normal. The power situation has been improved and earnings latterly have been running at close to record levels.

McIntyre Mine to Have Deepest Shaft in Dominion.

Exceptional developments in the lower levels of the McIntyre-Porcupine mine are understood to be the hasis for launching an elaborate expansion campaign designed to place this company second only to Hollinger among Canada's gold producers. The pivot of the entire project is a new main shaft to reacb a depth of 5,000 feet, the deepest in the Dominion, and close to the deepest on the Rand. New deposits are regarded as assured in virgin territory under the dipping porphyry formation.

La Rose Mines, Ltd., bave taken an option on a group of claims in Rouyn township aggregating 500 acres, which are in well located territory. A small gang of men is now employed in prospecting and trenching.

4,500 Tons Daily at Hollinger.

By utilizing about 800 horse power from its auxiliary steam plant the Hollinger Mines is operating its mill on a basis of 4,500 tons per day. Further increases in tonnage depend entirely on the power supply, and if it was available in adequate volume the mill's daily tonnage would be raised to 8,000. The first unit of the lower Sturgeon power plant will be available before long and will be developing 3,500 horse power. The second unit will be ready, it is claimed, by fall.

Contract For Hollinger Power Development Awarded.

The contract for the dam and power bouse for the power development of Hollinger Consolidated at the Island Portage on the Abitibi River has been awarded to Sir Wm. Arrol, Ltd., of St. Catharines, Ont. Present plans call for the installation of equipment with a productive capacity of 25,000 horse power, of which 20,000 will be delivered at the mines for the use of the Hollinger Co., and a further 2,000 will be delivered to the municipalities in the immediate neighborhood. It is anticipated that the development will be complete and power available for distribution in the fall of 1924.

Native silver in a vein of quartz is the latest development in the Cobalt-Lorrain silver field, and scores of mining claims are being staked out in the immediate vicinity of the new find. The deposit is upwards of one foot in width and with heavy leaf silver occurring in the quartz.

Silver exported from Canada during June was valued at $591,178, as compared with $755,545 in June, 1922.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

NOTE.—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Phenolic Condensation Products. D. S. Kendall, 232,251, June 26, 1923. Phenol and Alcohol are heated in the presence of a small percentage of H_2SO_4 until a permanently fusible soluble resin is formed and the acid is neutralized and removed. Hexamethylenetetramin may be added to the resin.

Wood Pulp Production. Geo. H. Tomlinson. 232,488, July 3, 1923. Wood is subjected to the action of a weak bisulphite solution and steam at a temperature below 130°, the reagent is withdrawn and the pulp is treated with a stronger bisulphite solution at a temperature below 150°.

Electric Accumulators. W. O. Garbutt. 232,684, July 17, 1923. Pb electrodes of an accumulator are desulphated hy freeing tbe plates from acid electrolyte with which they have been used and electrically charging them while immersed in a strong solution of an alkali oxide or hydroxide.

Process of Treating Black Liquor Produced in the Manufacture of Sulphate Pulp. G. A. Richter and D. H. McMurtrie, 232,746, July 17, 1923. The black liquor resulting from the digestion of wood in making sulphate pulp is concentrated, S. is added and the mixture smelted. Na_2CO_3 may be added to the molten effluent to compensate for the loss thereof by the reaction of S with Na_2CO_3 initially in the spent liquor.

Foam For Fire Preventor. G. H. L. Kent, 232,771, July 17, 1923. A solution for producing a fire extinguishing foam contains $NaHCO_3$ and a salt of a mineral oil sludge sulphonic compound in water.

Apparatus For the Synthesis of Ammonia. G. Claude, 232,760. July 17, 1923.

Concentration of Ores by Flotation. G. E. Sheridan and G. G. Griswold, 232,518, July 10, 1923.

Mending Composition. C. A. Wright, 232,583, July 10, 1923. A compound for mending cracks in cast-iron or other metal vessels, contains Al 5-10% and S 90-95% combined at a temperature not exceeding 250° F.

Recovery of Hydrogen Sulphide. F. W. Sperr, 232,598, July 10, 1923. A gas containing H_2S is passed into contact with a suspension of $Mg(OH)_2$ to absorb the H_2S. The suspension containing the H_2S is preheated, then further treated to expel the H_2S and to regenerate tbe suspension, the liberated vapors being used to preheat the suspension.

Recovery of Hydrogen Sulphide. F. W. Sperr, 232,599, July 10, 1923. Gases containing H_2S are passed into contact with a suspension of $Ca(OH)_2$ and CaS_2 to absorb the H_2S. The suspension is preheated by the liberated gas, then further heated to expel the H_2S and to regenerate the suspension.

Cyanogen Recovery Process. F. W. Sperr, 232,600, July 10, 1923. $Na_2Fe\ Fe(CN)_6$ is suspended in a solution of Na_2CO_3 and brought into contact with a gas containing H_2S and HCN. The $Na_4\ Fe(CN)_6$ formed is decomposed with $NaHSO_4$ to liberate HCN and form $Na_2\ Fe\ Fe(CN)_6$ for reuse. The Na_2SO_4 formed may he converted to Na_2CO_3 for further use in the process by the LeBlanc process.

Manufacture of Hydrogen Sulphide. F. W. Sperr, 232,601, July 10, 1923. A gas containing H_2S is passed through a Na_2S solution to absorb the H_2S from the gas; the preheated solution is further heated to liberate the H_2S and to regenerate the solution. The solution is preheated by passing it in countercurrent with the liberated H_2S and the regenerated solution, the latter is cooled and passed back to the gas treatment stage.

Recovery of Hydrogen Sulphide. R. E. Hall, 232,602, July 10, 1923.

Selective Flotation of Minerals. G. A. Bragg, 232,606, July 10, 1923. The selective flotation of Pb and Zn sulphides is effected by subjecting a slightly alkaline pulp of such minerals to a flotation operation in the presence of a small amount of soluble sulphite.

Manufacture of Rubber-like Substances. H. Plauson, 232,642, July 10, 1923.

Manufacture of Rubber-like Substances. H. Plauson, 232,641, July 10, 1923.

Manufacture of Lithopone. F. C. Breyer and C. W. Farber, 232,441, July 3, 1923.

Regenerating Sulphurous Acid and Waste Heat From Sulphite Cellulose Boilers. K. Hangleiter and A. Schneider, 232,272. June 26, 1923. The pressure in the boilers is lowered by withdrawing much of the gas which is led into a container, tben the rest of the gas is withdrawn through anotber main through which fresh lye is passing to the container. The heat and SO_2 are absorbed by the fresh lye.

Process of Making Sodium Sulphides. V. Drewsen, 232,993, July 24, 1923. Milk of MgO liquor is agitated in absorption tanks through which SO_2 gases are passed in opposite direction to form magnesium bisulphite, which solution is reacted upon witb NaCl to form and precipitate $NaHSO_3$.

Method of Producing Alloys. A. Pacy, 232,935, July 24, 1923.

Electroplating with Zinc on a Mercury Treated Cathode. J. Haae, 232,981, July 24, 1923. Ferrous articles are electroplated by first dipping the articles in a solution of a Hg compound and then plating in a Zn bath containing cyanide.

SUGAR INDUSTRY NOT SO ACTIVE.

A continuance of the slowing down of activities in the Canadian sugar industry as compared with 1922 is to be noted for the four-week period ending June 16, 1923. During this period stocks of both raw and refined in the hands of refiners increased, while receipts and meltings were curtailed. There is another drastic decline from the remarkable export shipments of 1922. Total shipments, both domestic and export, for the four-week period show a decline from 1922 of nearly 50 per cent.

ENCOURAGING TESTS FROM ROUYN GOLD FIELD.

Assays of "float" taken from the north shore of Osisko Lake, in the township of Rouyn, Quebec, show a good content of upwards of $300 a ton. As a consequence of this the owners of mining claims in the vicinity are encouraged to intensify their efforts to locate the outcrop from which the "float" came. The rich samples are described as resembling the sulphide ore on the Horne property on the west shore of Osisko Lake, and having similar characteristics to the deposit just opened up a few days ago on the McLeod property, five miles to the north.

MILK SUGAR NOW MADE IN CANADA.

Allen & Hanbury's, Limited, of Canada, are undertaking the production in quantity of both crude and refined milk sugar, casein and albuminoids, at their plant at Lindsay, Ont. Tbey are the largest consumers of milk sugar in Canada, and the parent company in England uses quite large quantities. This is a develop-

ment that may well lead to considerable business, as the product is one which is in good demand, and is a natural deevlopment of our dairy industry.

J. T. Donald & Co., Chemical Engineers, are directing this development.

REPORT ON SILICA DEPOSITS OF EASTERN CANADA.

Silica, in the form of quartz, quartzite, sandstone, sand, etc., has been utilized for many years in a number of manufacturing industries. It is widely distributed in nature and is found in all degrees of purity. In the form of sand it is employed in the manufacture of glass, carborundum, and in the steel foundries. In lump form it enters into the manufacture of ferrosilicon, and is also used as a flux in metallurgical operations. When finely pulverized, it is used in pottery bodies, and also in the enameling and paint industry.

A report on Silica, by L. Heber Cole, recently published by the Mines Branch, Department of Mines, Ottawa, discusses the occurrence, exploitation, and uses of this product, and describes in some detail the many occurrences of this material in Eastern Canada, including many undeveloped deposits that may in the future become of considerable industrial importance.

The principal markets for silica are located in the large industrial centres of the country, such as Montreal, Toronto, Hamilton, etc. There are many deposits favorably situated in the Provinces of Ontario and Quebec, which, if properly operated, should be able to readily compete with similar material which at present is being imported from the United States.

This report on Silica, which comprises 119 pages of text, is profusely illustrated with diagrams and photos, and is accompanied by a complete set of maps showing the distribution of silica deposits. It may be obtained by application to the Director, Mines Branch, Department of Mines, Ottawa.

DIRECTORY OF CHEMICAL MANUFACTURERS.

The publication of the New Edition of the Official Directory of the Association of British Chemical Manufacturerers for 1923 will be welcomed by all those interested in Chemical Industry, containing, as it does, a list of some 150 bona fide chemical manufacturers of the United Kingdom, with a classified list of the products which they manufacture, and including a section devoted to Proprietary and Trade Names. The new list of products contains considerably more detail than the previous edition, and the name of each product being translated into French, German, Italian, Spanish and Portuguese should be extremely useful to overseas buyers. The object of the publication is to facilitate business relations between Manufacturers and Chemical firms and purchasers all over the world, and the Association welcomes inquiries with regard to any particular product.

Copies of the Directory may be purchased at a cost of 10s. 6d. from the offices of the Association, 166 Piccadilly, London, W.1.

REFERENCE BOOK OF GERMAN CHEMICALS.

"Taschenbuch Fur Den Chemikalienhandel."

(Reference Book for the Chemical Trade), 2nd edition; by Dr. J. Bischoff.

The first edition is a booklet for the purpose of acting as a guide for anyone in the chemical trade. The present edition (the second) is an extension of the first.

The contents are:

(1) A list of chemicals, in their various grades, obtainable in the German chemical market. In this table, several properties and their uses are also listed. The completeness of the table is a striking feature, and the code-word, in conjunction, makes the specifications, which are necessary, very short. Foreign names are also given, such as English, French, Spanish.

(2) A table of foreign (to Germany) chemical terms, that occur frequently in trade and literature—quite complete.

(3) An alphabetical table of code words, used to designate the chemicals.

(4) A formula index, so that, given the formula of a compound, its name can easily be found.

This booklet should prove of great valuc to anyone contemplating the purchase of chemicals from Germany. The completeness of the stock is amazing. Owing to the unsettled state, no prices oan be given.

COMPANY NEWS.

Credit-Canada, Limitee, is offering a new issue of $250,000 eight per cent. first mortgage 10-year sinking fund gold coupon bonds of Asbestos Mines, Ltd. The company, generally known as Jacobs Asbestos, of East Broughton, owns 400 acres of asbestos lands at Broughton, Que. Assets, including plants, machinery, buildings, surface improvements, etc., have been appraised at well over half a million. The bonds are being offered at par and accrued interest to yield 8 per cent.

The Paramount Rubber Consolidated (Canada), Limited, with head office in Montreal and factory in Sherbrooke, will soon be reorganizing the plant of the defunct Regal Tire and Rubber Co., in Sherbrooke, and will have a fairly large number of employees engaged in the manufacture of its different lines, which include rubber play balls, toys, drug sundries, inflated balls, solid balls, plain and decorated, and patented moulded articles.

STANDARD CHEMICAL COMPANY IMPROVES POSITION.

While the Standard Chemical Co. experienced better business during its fiscal year, ending March 31st, it was not able to effect more than a nominal reduction of the debit balance carried forward from the previous year. Operating profits amounted to $292,110, compared with $20,861 for 1922. The net profits for this year were $42,626, while last year showed a deficit of $762,368. The deficit has now been reduced to $581,462.

The President, Mr. David Gilmour, states that the revival in the United States resulted in the absorption of their large stock of wood products, leaving very little surplus available for the European market. This resulted in an improvement in prices, which affected advantageously Canadian business in this particuiar linc. Charcoal prices have also been favorable, but a considerable reduction in the future is anticipated.

The assets of the company are carried at $6,242,060, against $6,733,670 in 1922, and liabilities are $209,169, instead of $681,185. The working capital position of the Company has improved by some $240,000.

The executive of the Standard Chemical Co. are to be congratulated on the showing the company has made, following last year's depression.

BRITISH BUSINESS NOTES.

At a meeting of the Dominion Tar & Chemical Co.. Ltd., held on July 3, the directors authorized the payment, on or before July 12, of an interim dividend of 2 1-2 per cent., free of income tax.

The Directors of the Mond Nickel Co., Ltd., have recommended a final dividend of 7 1-2 per cent., free of tax, making 10 per cent. for the year on the ordinary shares.

The report of the British Dyestuffs Corporation, Ltd., for the year ending October 31, 1922, states that the result of the year's transactions, after providing £411,382 for depreciation and crediting further amounts estimated to be recovered, is a profit of £102,656. The debit balance brought forward from the previous period amounted to £803,355, which leaves a deficit of £700,698 to be carried forward.

CATALOGUES RECEIVED.

Blair, Campbell & McLean, Limited, Glasgow, Scotland. This internationally known firm of chemical plant builders have issued a series of five catalogues descriptive of their products. Section D. catalogue deals with Distilling Apparatus of all types. A few of the types, illustrated and described, are: Copper still for direct firing with retort and condensing coil; copper steam jacketed stills with retort and condensing coils, made of solid copper, inner bottom fitted into cast-iron steam jackets, surmounted by copper domes, copper heads and lying pipes with retorts and condensing piping of copper; direct firing and steam jacketed copper stills with retorts and rectifier; rectifying stills to yield spirit 96-97%; benzine and naphtha rectifying apparatus; continuous working steam stills; molasses pumps, etc.

In this Section, as in all the other catalogues, each piece of equipment is well-illustrated and all necessary details given. The catalogue dealing with Evaporating Plant would prove interesting and valuable to chemical engineers in almost any kind of chemical work. The science of evaporation has made considerable progress during recent years, and manufacturers of such equipment are now turning out highly efficient and modern apparatus for all processes requiring the removal of water from dilute solutions. The chief types illustrated and described are the Multiplex Triple Effect Film Evaporators, Simplex Patent Film Evaporator, Standard Vertical Type Evaporator, special Evaporators for Salting Liquors.

The remaining two catalogues deal with special chemical plant, dye-making, drug-making, and pure chemical machinery; and Sugar plant apparatus and machinery.

The catalogues are neatly and attractively gotten up, well illustrated, and would make a suitable addition to any plant library.

Chemical, Oil and Metal Markets

CHEMICALS.

But slight change is noted in the position of the chemical market at the beginning of August as compared wiht the July 1st situation. Not a few dealers report that business shows an improvement over the month, while others are equally certain that things generally are quiet with little prospect of improvement. On the whole, quotations on most lines are weaker, though it must not be assumed that the market is "falling." On the contrary, some chemicals show a distinct improvement with advanced prices. Included in the latter group are acetic acid, acetone, tartaric and cirtic acids, calcium chloride, carbon bisulphide and tetrachloride, hexamethylene-tetramine and carbolic acid (crystals). Declines are registered on formic acid, oxalic acid, alum, borax crystals, ferric chloride, glycerine, potassium chlorate, sodium acetate, chloroform, potassium bromide, copper sulphate. Demand generally is quiet, though some of those who have been connected with the market for a number of years, declare

that it is not abnormally so for the summer season. The condition of the consuming industries is, of course, reflected in the chemical market, hence there is a poor demand from the textile mills where business has slowed down considerably of late. The large drug houses are experiencing a very poor season, due to a falling off in buying from the retailers, who had a very bad spring trade. Consequently demand for pharmaceuticals is weak with lower prices prevailing. The pure food companies report busniess as very poor. Demand for tanning chemicals has also fallen off, so that these four branches of trade allied to the chemical market present a rather gloomy picture. Offsetting these, however, demand is good and keeping up well from the steel mills, the rubber works, paint and varnish industry, and the pulp and paper mills. Competition continues keen in many lines, with shading of prices evidenced in some quarters.

Caustic soda, soda ash, bleaching powder, are keeping in fair demand at firm quotations. While buying of the heavy acids, sulphuric and nitric, is not quite so good as last month, prices are keeping steady. Considering everything, business in the heavy chemicals is not too bad, especially for the summer season, and while large orders are conspicuous by their absence, yet prospects are for a good autumn trade, provided the general industrial situation remains steady.

Arsenic has not yet returned to its high quotation of May and June, but is holding at the reduction noted at July 1st, to 13 to 15 cents per pound. The boll weevil has not appeared in the Southern cotton fields to the extent predicted, hence makers of calcium arsenate find themselves overstocked, and this large market for arsenic is closed, temporarily at least.

METALS.

The steel market is quite active and dealers generally report that July business has been very fair indeed. Every blast furnace in Ontario is reported in operation on August 1st, with operations running about 80 per cent. of capacity. Quotations are steady and firm. During July, quotations on lead suffered a decline to nearly 6 cents per lb., but towards the end of the month recovered and are now 5 cents per cwt. better than at July 1st; present quotations being $6.65 per cwt. for car lots. The cause of the slump in July on lead was really due to the efforts of American producers to shut off imports of foreign lead, as European producers were paying the duty of 2 1-2 cents per lb. and still underselling American lead in New York. Quotations on domestic lead were then automatically reduced to below production costs until the foreign material was chased out of the market. Demand for lead has kept up well and there is no reason why good autumn business should not be experienced.

Quotations on zinc, car lots, are some 40 cents per cwt. stronger than at July 1st, and demand continues fair. Copper is weak, with quotations reduced, and an unsettled market prevailing. Canadian producers are now about cleaned out of stock, and production is being resumed.

CURRENT CANADIAN MARKET QUOTATIONS ON CHEMICALS, GUMS, OILS AND METALS.

GENERAL CHEMICALS

Acetaldehyde, 99%, carlots, 20,000 lbs. and over	lb.	.15	—
Less than carlots	lb.	.16	—
Both quotations f.o.b. Shawinigan Falls, Que.			
Acetone, pure, drums or over	lb.		— .34
Lesser amounts	lb.		— .40
ACID—			
Acetic, 28%, car. lots	100 lbs.		— 5.05
28%, 25 bbl lots	100 lbs.		— 5.30
28%, 10 bbl. lots	100 lbs.		— 5.55
28%, 5 bbl. lots	100 lbs.		— 5.80
28%, 1 or 2 bbl. lots	100 lbs.		— 6.05
80%, carload lots	100 lbs.		—14.00
80%, 25 bbl. lots	100 lbs.		—16.00
80%, 15 bbl. lots	100 lbs.		—17.00
80%, 10 bbl. lots	100 lbs		—17.25
80%, 5 bbl. lots	100 lbs		—17.75
80%, 3 or 4 bbl. lots	100 lbs.		—18.75
80%, 1 or 2 bbl. lots	100 lbs.		—19.00
Glacial, bbls.	lb.		— .12
Carboys	lb.		— .12½
Boric, crystals, bbls.	lb.		— .13
Boric, powder, bbls.	lb.		— .12½
Benzoic	lb.	.85	— .90
Butyric, 98-99% pure, f.o.b. Shawinigan Falls	lb.	1.00	—
Citric, kegs	lb.	.55	— .60
Formic, 75%, carboys, 100 lbs.	lb.	.20	— .21
Gallic, tech	lb.	.50	— .55
Gallic, B. P.	lb.	1.25	— 1.50
Hydrochloric, 18°, carboys, 100 lbs.	lb.	2.25	— 2.75
Hydrofluoric, 60%	lb.	.22	— .25
Hydrofluoric, 30%	lb.	.11	— .13
Lactic, 44%, tech., light, bbl.	lb.		—
Lactic, 22%, tech , light, bbl.	lb.		—
Muriatic, see acid hydrochloric.			
Nitric, 36°, carboys	100 lbs.	8.25	— 9.00
Oleic	lb.		— .26
Oxalic	lb.	.11	— .13
Phosphoric, 85%	lb.		— .28
Phosphoric, 50%	lb.		— .22½
Pyrogallic, resublimed	lb.	2.00	— 2.10
Salicylic, tech., bbl	lb.	.47	— .48
Salicylic, B.P. bbl	lb.	.50	— .52
Sulphuric, 66°, carboys	100 lbs.	2.25	— 2.75
Sulphuric, 66°, tank cars, f.o.b. works	ton	23.75	—24.00
Stearic, double pressed	lb.	.22	— .24
Stearic, triple pressed	lb.	.25	— .27
Tannic, B.P.	lb.	.80	— .90
Tannic, tech	lb.	.45	— .55
Tartaric, crystals, bbls.	lb.	.35	— .40
Tartaric, powder, bbls.	lb.	.36	— .42
ALCOHOL, absolute Ethyl, case of 1 doz. 1 lb. bottle			— 3.15
In steel drums of 10 gals. capacity	Imp. gal.		—23.00
Acetone, bbls. or over	gal.		— 1.50
Lesser amounts	gal.		— 1.80
Aldehyde Ammonia	lb.		— .75
Alum, Ammonia, lump or ground	100 lbs.	3.75	— 4.50
Aluminium Sulphate, lump bags	100 lbs.	2.25	— 2.50
Ground, bags	100 lbs.	2.50	— 2.75
Iron, free	100 lbs.		— 4.00
Ammonia, aqua, 26°, carboys	lb.	.13	— .14
Drums	lb.		— .09½
AMMONIUM, Carbonate	lb.	.12	— .15
Chloride	lb.	.10	— .13
Amyl Acetate, tech	gal.		— 4.00
Pure	lb.		— .80
Arsenic, white	lb.	.13½	— .15
BARIUM, Sulphate, B.P.	ton		—60.00
Chloride	lb.	.06	— .08
Nitrate	lb.		— .16
Peroxide	lb.		— .26
Blanc fixe, dry, bbl.	lb.		—
Pulp, bbl.	ton		—
Bleaching Powd., 35%, drums	lb.	2.50	— 3.00
Borax, crystals	lb.	.05½	— .05¾
Bromine, tech	lb.		— .38
Benzaldehyde	lb.	1.35	— 1.60
Butylaldehyde	lb.	.60	—
CALCIUM ACID, Phosphate	lb.		— .07½
Carbide, ton lots, f.o.b. wks.	ton		—95.00
Carbide, less than ton lots	ton		—100.00
Chloride, fused	ton		—35.00
Chloride, flake	ton	48.00	—50.00
CAUSTIC SODA, flake, drms.	100 lbs.	5.00	— 5.50
Ground, drums	100 lbs.	5.00	— 5.50
Solid, drums	100 lbs.	4.25	— 4.75
CARBON BISULPHIDE, drums	lb.	.14	— .15
Tetrachloride, drums	lb.		— .18
Chlorine, liquid, in cylinders of 150 lbs.	lb.	.08	— .09
Cobalt Oxide, black	lb.		— 2.00
Grey	lb.		— 2.25
Copperas, crystals	lb.	.02	— .02½
Sugar	lb.	.02	— .02½
Copper Sulphate (blue vitriol)	lb.	.07½	— .08
Corrosive Sublimate	lb.	1.00	— 1.50
Cyanide, Crude	lb.		— .22
Dextrine, potato	lb.		— .06
Corn	lb.		— .08½
ETHER, B.P. (conc.)	lb.		— .55
Sulphuric	lb.	.30	— .35
Ferric Chloride, crystals	lb.	.08½	— .09
Solution	lb.		— .06
Formaldehyde, bbls. or over	lb.		— .19½
200-lb. kegs	lb.		— .24½
100-lb. kegs	lb.		— .25½
50-lb. kegs	lb.		— .26½
Fullers' Earth, powder	100 lbs.	2.00	— 2.50
Car lots, f.o.b. Toronto	ton		—30.00
Fusel Oil, special, refined	gal.	4.00	— 4.50
Glycerine, crude, drums	lb.		— .15
Crude, single tin of 56 lb.	lb.		— .17
C.P., single tin of 56 lbs.	lb.		— .27½
C.P., two or more tins	lb.		— .25½
C.P. drums, 500-1,000 lbs.	lb.		— .19½
Pale straw, drums, 500-1,000 lbs.	lb.		— .18½
Pale straw, single tin 56 lb.	lb.		— .26½
Pale Straw, 2 or more tins.	lb.		— .24½
Hexamethylene Tetramine	lb.	.90	— .95
Hydrogen Peroxide	gal.		— .75
Iron Oxide, red, casks	lb.	.13	— .20
LEAD, Acetate	lb.	.14	— .16
Nitrate	lb.	.14	— .15
Lime, grey	ton		—14.30
Grey, in car lots	ton		—11.70
Hydrated, in ton lots	ton		—20.00
Litharge	lb.	.09	— .10
Lithopone	lb.		— .07½
Magnesite, Calcined	ton		—30.00
Clinkered	ton		—35.00
Raw	ton		—10.00
MAGNESIUM, Carbonate, bbls.	lb.	.14	— .16
Sulphate, B.P.	ton	60.00	—70.00
Technical, car lots	ton	35.00	—40.00
Methyl Hydrate (wood Alcohol), 95%, bbls. or over	gal.		— 1.15
95%, half-bbl. lots	gal.		— 1.25
95%, lesser amounts	gal.		— 1.30
97%, bbls	gal.		— 1.20
97%, half-bbl. lots	gal.		— 1.35
97%, lesser amounts	gal.		— 1.50
Nickel Salt, single, in bbl. lots.	lb.		— .13½
Single, per cwt.	lb.		— .15
Double, barrel lots	lb.		— .14
Double, per cwt.	lb.		— .15½
Phosphorus, yellow	lb.		— .34
Potash Prussiate, yellow	lb.	.95	— 1.00
POTASSIUM, Bicarbonate	lb.		— .20
Bichromate	lb.	.15	— .16
Carbonate, calc. 80-85%	lb.		— .14
Chlorate	lb.		— .12
Citrate	lb.	.90	— 1.00
Hydroxide (caust. potash)	sticks		— .45
Hydroxide (caustic potash), small drums	lb.	.10	— .15
Hydroxide (caustic potash) large drums	lb.	.09	— .10
Nitrate, casks	lb.	.08½	— .09
Permanganate, bulk	lb.	.19	— .20
Red Precipitate (mercuric ox.)	lb.		— 1.75
Silver Nitrate	lb.		— 9.00
Soda Ash, bags	cwt.	2.25	— 2.40
SODIUM, Acetate, ton lots or ov.	lb.		— .06
Lesser amounts	lb.		— .06½
Aluminium Phosphate	lb.		— .03½
Benzoate	lb.	.70	— .75
Bicarbonate, 100% pure	lb.	2.50	— 3.00
Bichromate, bbls.	lb.	.10	— .13
Bisulphite, powder	lb.	.05½	— .06
Bisulphite, 35 Be.	lb.	.03	— .03½
Bromide (foreign)	lb.		— .28
Cyanide, bulk, 98-99%, in cases	lb.		— .34
Fluoride, 95-98%	lb.	.15	— .16
Hyposulphite, kegs	100 lbs.	4.75	— 5.00
Barrels	cwt.	4.00	— 4.50
Iodide	lb.		— 5.20
Nitrate, refined	cwt.	6.75	— 7.00
Crude, 95%	cwt.	5.25	— 5.75
Nitrite	lb.	.12	— .15
Perborate, U.S.P.	lb.	.35	— .40
Peroxide, f.o.b. New York	lb.	.25	— .27
Silicate, 42°, car lots	cwt.		— 1.35
Smaller lots	cwt.		— 1.55
Silicate, 40°, car lots	cwt.		— 1.25
smaller lots	cwt.		— 1.45
Sulphide, 60-62% fused, drums car lots	lb.	.05	— .05½
Sulphate (Glauber's Salts), crystals, in bags	cwt.	1.80	— 2.00
Car lots	cwt.	1.65	— 1.75
Sulphite	lb.		— .02
Prussiate, yellow	lb.	.24	— .25
Sulphur, ground	100 lbs.	2.50	— 2.75
Roll	100 lbs.	4.25	— 4.75
Talc, No. 1 grade	ton		—30.00
No. 2 grade	ton		—25.00
No. 3 grade	ton		—23.00
Tin Chloride, crystals	lb.	.30	— .35
Tri-Sodium Phosphate	lb.	.07	— .07½
Ultramarine, blue	lb.	.10	— .29
White Precipitate (mercuric-Ammonium chloride)	lb.	1.90	— 2.00
Whiting (English)	ton		—30.00
(American)	ton		—28.00
ZINC, Sulphate, com	lb.	.05	— .05½
Dust	lb.	.13	— .14½
Oxide, lead free	lb.	.11	— .12
Stearerate	lb.	.30	— .35

PHARMACEUTICAL CHEMICALS

AMMONIA, Aqua, C.P.	lb.		— .22
Iodide	lb.		— 6.25
Asperin, 100 lb. lots, bulk	lb.	.85	— .95
Caffeine, English	lb.		— 3.50
Calomel (mercurous chloride	lb.	1.55	— 1.60
Camphor, Monobromate	lb.		— 2.60
Refined, slabs	lb.		— 1.28
Refined, Tab	lb.		— 1.32
Carbolic Acid, white crystals.	lb.	.45	— .45
Chloroform	lb.	.40	— .45
Coumarin	lb.	3.75	— 4.00
Cream Tartar, 98%	lb.	.25	— .30

Ether, B.P.	lb.	—	.55
Iodine, crude	lb.	4.50 —	4.75
Resublimed	lb.	5.50 —	5.60
Lithium Carbonate	lb.	1.80 —	2.10
Potassium Bromide, crystals	lb.	.20 —	.22
Granular	lb.	.20 —	.22
Iodide	lb.	—	4.50
Phenacetin	lb.	1.75 —	2.00
Phenolphthalein	lb.	—	1.75
Quinine	oz.	.70 —	.75
Saccharin	lb.	1.75 —	2.25

SYNTHETICS

Benzyl, Acetate	lb.	—	1.75
Benzoate	lb.	—	1.75
Citral	lb.	—	4.50
Coumarine	lb.	—	3.50
Heliotropine	lb.	—	5.00
Linalyl Acetate	lb.	—	13.50
Methyl Salicylate	lb.	—	.75
Musk, Xylol	lb.	—	3.00
Teyseniol	lb.	—	1.00

ESSENTIAL OILS

Anise	lb.	—	.80
Bay	lb.	—	3.00
Bergamot	lb.	—	4.50
Cajaput	lb.	—	1.25
Camphor, white	lb.	—	.50
Brown	lb.	—	.25
Cassia	lb.	—	2.00
Cedar Leaf	lb.	1.90 —	2.00
Cedar Wood	lb.	—	.50
Citronella, Ceylon	lb.	—	.60
Java	lb.	—	.85
Clove	lb.	—	2.25
Eucalyptus	lb.	—	.65
Geranium Bourbon	lb.	—	7.50
Lavender	lb.	—	5.00
Spike	lb.	—	1.25
Lemon	lb.	—	.75
Lemongrass	lb.	—	1.35
Lime, distilled	lb.	—	1.00
Orange Sweet, Sicilian	lb.	—	3.50
West Indian	lb.	—	3.00
Peppermint, American	lb.	—	3.50
Japanese	lb.	1.75 —	2.00
Redistilled, B.P.	lb.	4.00 —	4.25
Pathouli	lb.	—	10.00
Otto of Rose	oz.	—	6.50
Rosemary	lb.	—	.65
Sandalwood	lb.	—	7.50
Sassafras	lb.	—	1.75
Thyme	lb.	—	1.45

VEGETABLE OILS

Castor Oil, No. 3, bbl.	lb.	.16½ —	.17½
No. 1, bbl.	lb.	.18 —	
Chinawood Oil	lb.	—	.27
Cocoanut, Ceylon, bbl.	lb.	—	.11
Cochin, bbl.	lb.	—	.12½
Corn Oil, bbls.	lb.	—	.12
Tank cars	lb.	.10 —	.10½
Cottonseed Oil, crude, f.o.b. U. S. mills, tanks	lb.	.10 —	.10
Summer, yellow, bbl.	lb.	.12 —	.12½
Winter, yellow, bbl.	lb.	.13 —	.13¼
Linseed Oil, 1 to 2 bbls., Raw, per gal. of 9 lbs.		—	1.25
3 to 5 bbls., Raw, per gal. of 9 lbs.		—	1.24
6 to 9 bbls., Raw, per gal. of 9 lbs.		—	1.22
Boiled Linseed Oil, 3c. per gal. higher than raw		—	
Monopole Oil	lb.	.07 —	.16
Olive Oil, foots	lb.	.12 —	.14

GUMS

Arabic, clear amber sorts	lb.	—	.20
Regular grain No. 4 and No. 5	lb.	—	.28
Regular grain No. 2	lb.	—	.31
White sorts	lb.	—	.35
Powdered, No. 1	lb.	—	.40
Powdered, No. 2	lb.	—	.39
Indian, No. 1A	lb.	—	.28
No. 1	lb.	—	.25
Tragacanth, No. 1, ribbon	lb.	—	3.00
No. 1, flake	lb.	—	2.00
Turkey	lb.	—	2.00

VARNISH RESINS

Congo, sorts	lb.	.10 —	.11
Hard amber	lb.	.11½ —	.18
White	lb.	.35 —	.45
Damar, Batavia	lb.	.35 —	.38
Singapore, No. 1	lb.	.39 —	.45
Singapore, No. 2	lb.	.20 —	.24
Singapore, No. 3	lb.	.09½ —	.12
East India, pale bold	lb.	.22 —	.25
Pale nubs	lb.	.15 —	.17
Pale chips	lb.	.07 —	.12
Black bold	lb.	.09 —	.12
Black nubs and chips	lb.	.05 —	.08
Kauri, XXXXX	lb.	1.60 —	
XXXX	lb.	1.25 —	
XXX	lb.	1.10 —	
XX	lb.	.90 —	
X	lb.	.80 —	
No. 1	lb.	.67 —	.70
No. 2	lb.	.45 —	.50
No. 3	lb.	.25 —	.30
B. X.	lb.	.55 —	.65
B. 2	lb.	.30 —	.35
No. 1 chips	lb.	.22 —	.27
Brown chips	lb.	.15 —	.20
Dust	lb.	.10 —	.15
Manila, Bold XXXXX	lb.	.21 —	.23
Nubs, pale	lb.	.18 —	.22
Nubs, amber	lb.	.10 —	.18
Soluble A	lb.	.16 —	.18
Soluble chips	lb.	.10 —	.12
Pontianac Bold	lb.	.20 —	.30
Genuine nubs	lb.	.14 —	.17
Genuine chips	lb.	.10 —	.12

WAXES

Bayberry	lb.	.35 —	.38
Beeswax, white, pure	lb.	—	.38
African	lb.	—	.30
Brazilian	lb.	—	.34
Chilean	lb.	—	.35
Refined	lb.	—	.31
Candelilla	lb.	.40 —	.42
Carnauba, No. 1, bags	lb.	—	.50
No. 2, North Country	lb.	—	.32
No. 3, North Country	lb.	—	.22
No. 3, chalky	lb.	—	.21
Ceresin, white	lb.	—	.12½
Yellow	lb.	—	.12
Japan	lb.	.19 —	.20
Montan, crude	lb.	.06 —	.07
Ozokerite, crude, brown	lb.	.16 —	.17
Black, 158°—160°, M.P.	lb.	.18 —	.19
Paraffin, 128°—130°, M.P., 250 lb. lots	lb.	—	.06
118°—120°, M.P., 250 lb. lots	lb.	—	.05
Parowax, blocks, 100 lb. lots	lb.	—	.08¾

SHELLAC

T.N.	lb.	—	.85
Superfine Orange	lb.	—	.90
A. C. Garnet	lb.	—	.82
Bone Dry	lb.	—	.99

NAVAL STORES, FLOTATION OILS

Pine Tar Oil, crude	gal.	—	.60
Refined	gal.	—	.65
Rosin, G., 280 lb. bbl. lots	bbl.	—	8.25
W.W., 280 lb. bbl. lots	bbl.	—	10.00
Turpentine, 1 bbl. lots	Imp. gal.	—	1.50
2 to 4 bbl. lots	Imp. gal.	—	1.47
Less than bbl. lots	Imp. gal.	—	1.60

PETROLEUM OILS AND DISTILLATES

Mid-Continent Crude, 42 W.	gal. bbl.	—	1.45
Pennsylvania Crude, 42 W.	gal bbl.	—	2.75
Coal Oil	gal.	—	.19
Fuel Oil, bbls.	gal.	—	.10.7
Tank cars	gal.	—	.08.7
Gasoline, motor	gal.	—	.25
Service stations	gal.	—	.29
Gasoline, lighting	gal.	—	.30
Naphtha	gal.	—	.24

COAL TAR PRODUCTS

Alpha—Naphthylamin	lb.	.46 —	.48
Benzol, 100%	Imp. gal.	—	.55
90%	Imp. gal.	—	.50
Carbolic Acid, crude, 25%	gal.	—	.44
Creosote Oil, crude	gal.	—	.40
Refined	gal.	—	.60
Coal Tar, crude	bbl.	—	10.25
Refined	bbl.	—	11.50
Coal Tar Pitch, bbls	cwt.	—	2.00
Cresol, U.S.P., f.o.b. N.Y.	lb.	.25 —	.29
Dip Oil, 25%, f.o.b. N.Y.	gal.	.25 —	.30
H. Acid, f.o.b N.Y.	lb.	.75 —	.80
Phenol, drums	lb.	.60 —	.65
Pyridine, f.o.b. N.Y.	gal.	4.00 —	4.25
Resorcinol, tech, f.o.b. N.Y.	lb.	1.50 —	1.60
Pure, f.o.b. N.Y.	lb.	—	2.25
Naphthalin, flake	lb.	—	.07
Balls	lb.	—	.08
Solvent Naphtha, refined	gal.	—	.48
Toluol, pure	gal.	—	.54
Xylene, pure, f.o.b. N.Y.	gal.	.65 —	.90
Comm., drums, f.o.b. New York	gal.	—	.37

FERTILIZER MATERIALS

Acid Phosphate	ton	$28.00—	30.00
Animal Tankage, per unit of ammonia		—	3.50
Per unit of bone phosphate of lime		—	.10
Nitrate of Sode	ton	70.00 —	75.00
Muriate of Potash	ton	—	40.00
Pure Ground Blood, per unit of ammonia		—	4.00
Steamed Bone Meal	ton	—	50.00
Sulphate of Ammonia	ton	68.00 —	70.00

TANNING AND DYEING MATERIAL

Chestnut Liquid Extract	lb.	.02½ —	.03½
Fustic Crystals	lb.	.24 —	.28
Ground Sumac	ton	70.00 —	75.00
Hematine Crystals	lb.	.18 —	.22
Hemlock Liquid Extract	lb.	.03½ —	.04
Liquid Sumac Extract	lb.	.06½ —	.07½
Logwood, Solid	lb.	.16 —	.19
Quebracho Liquid Extract	lb.	.03½ —	.04
Quercitron Liquid Extract	lb.	.07 —	.08

CRUDE RUBBER

The following quotations on Rubber are in American funds, New York delivery:—

Para, upriver fine	lb.	$ —	.26¾
Upriver, coarse	lb.	—	.24
Caucho hall	lb.	—	.25
Plantation, 1st latex crepe	lb.	—	.27
Ribbed smoked sheets	lb.	—	.27
Brown crepe, thin, clean	lb.	—	.25½
Amber crepe, No. 1	lb.	—	.26½

MISCELLANEOUS MATERIAL

Asbestos, crude, No. 1, f.o.b. Quebec	ton	—	500.00
Shingle, f.o.b. Quebec	ton	65.00 —	80.00
Cement, f.o.b. Quebec	ton	21.00 —	25.00
Barytes, floated	ton	30.00 —	36.00
Crude, f.o.b. mines	ton	10.00 —	11.00
Casein, tech., bbls.	lb.	.28 —	.30
China Clay, f.o.b. Huberdean, Que., car lots	ton	17.00 —	18.00
Imported	ton	20.00 —	23.00
Feldspar, No. 1, f.o.b. mill	ton	—	22.00
Firebrick, Scotch, depending on grade	M.	70.00 —	80.00
American, depending on grade	M.	75.00 —	90.00
Fluorspar, ground	ton	25.00 —	28.00
Graphite, crude high grade	ton	35.00 —	40.00
Ceylon, lump	lb.	.06 —	.06½

INDUSTRIAL GASES

Acetylene, cylinders	100 cu. ft.	$2.55—	3.00
Coal Gas, cylinders	100 cu. ft.	3.00 —	4.00
Hydrogen, cylinders	100 cu. ft.	1.50 —	2.00
Nitrogen, cylinders	100 cu. ft.	2.00 —	3.00
Oxygen, cylinders	100 cu. ft.	1.50 —	2.00

METALS

Aluminium, 98-99%, 15 ton lots	lb.	—	.24
Antimony	lb.	—	.08
Brass, yellow ingots	lb.	—	.12
Red	lb.	—	.16½
Rods	lb.	—	.19
Cobalt	lb.	3.00 —	3.25
Copper electrolytic, small lots	cwt.	—	16.90
Car lots	cwt.	—	16.40
Casting, small lots	cwt.	—	15.40
Casting, car lots	cwt.	—	15.40
Gold, pure	oz.	23.00 —	25.00
Iron, pig	ton	—	34.00
Bar iron, base	cwt.	—	3.75
Lead, pig, small lots	cwt.	—	7.15
Car lots	cwt.	—	6.65
Magnesium, ribbon	oz.	—	1.50
Ribbon	lb.	—	18.00
Powder	oz.	.60 —	.65
Monel Metal, machined rods	lb.	—	.50
Blocks	lb.	—	.34
Shot	lb.	—	.34
Sheet, hot rolled, on orders of over 500 pounds, of one gauge	lb.	—	.48
rods, hot rolled	lb.	—	.42
Rods, cold rolled	lb.	—	.53
Nickel, shot or ingot	lb.	—	.35
Platinum, pure	oz.	—	124.00
5% iridium	oz.	—	128.00
10% iridium	oz.	—	138.00
Silver, bar, American silver	oz.	—	.99¼
Bar, Canadian produced, U.S. funds	oz.	—	.62¾
Steel, mild, ¼-inch, base price	cwt.	—	3.75
3/16-inch, base price	cwt.	—	4.25
Black sheet, 28 gauge, size 30"	cwt.	—	5.65
Black sheet, 28 gauge, size 36"	cwt.	—	5.75
Sheets, galvanized, 28 gauge, 30"	cwt.	—	6.75
Blue sheets, base	cwt.	4.50 —	4.60
Sheets, galvanized, 28 gauge, 36"	cwt.	—	7.00
Tin	lb.	—	.50
Zinc, sheets	lb.	—	.13
Zinc, (spelter), small lots	cwt.	—	8.25
Car lots	cwt.	—	7.75

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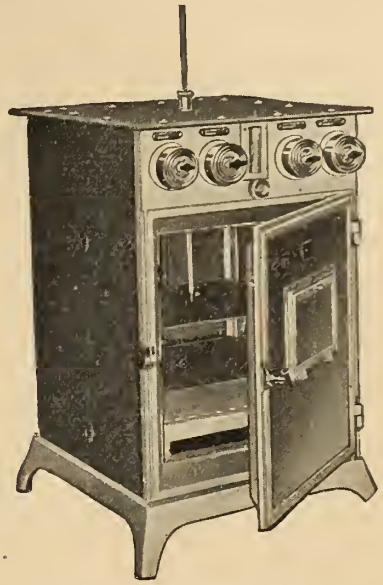

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Canadian Electric Products Co., Power Building, Montreal.
Standard Chemical Co., Montreal.

Acetone and Acetates—
Standard Chemical Co., Montreal.

Acids—Commercial—
Nichols Chemical Co., 222 St. James Street, Montreal. 126 Mill Street, Toronto.

Acid Plants—
General Ceramic Co., 50 Church Street, New York, N.Y.

Acids—Laboratory C.P.—
Canadian Laboratory Supplies, Ltd., 439 King Street W., Toronto.
Lymans, Ltd., Montreal.

Acid Proof Centrifugal Pumps—
G. H. Elmore, Colonial Trust Bldg., Philadelphia, Pa.
Hoyt Metal Co., Eastern Ave., Toronto.

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Acid Resisting Pipe and Valves—
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Alcohol—Absolute Ethyl—
Canadian Industrial Alcohol Co., Montreal, Canada.

Alcohol—Ethyl or Grain—
Canadian Industrial Alcohol Co., Montreal.

Alcohol—Methyl or Wood—
Standard Chemical Co., Ltd., Toronto.

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Nichols Chemical Co., Toronto and Montreal.

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Cosmos Chemical Co., Port Hope, Ont.

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Canadian Ammonia Co., Ltd., Toronto.

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Central Scientific Co., 460 East Ohio St., Chicago, Ill.
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Eimer & Amend, 3rd Ave., 18th to 19th Sts., New York, N.Y.
Lymans, Limited, Montreal.
Scientific Materials Co., Pittsburgh, Pa.
Arthur H. Thomas Co., West Washington Sq., Philadelphia, Pa.

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Automatic Telephones—
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Brimstone—
Union Sulphur Co., 17 Batterry Place, New York, N.Y.

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Canada Carbide Co., Power Building, Montreal.

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Wilson, Paterson, Gifford Co., Board of Trade Building, Montreal.
Standard Chemical Co., Montreal.
Sterne, G. F. & Sons, Limited, Brantford, Ont.
E. A. Schofield & Co., St. Nicholas Bldg., Montreal. Bank of Hamilton Bldg., Toronto.

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Canadian Laboratory Supplies, Ltd., 439 King Street W., Toronto.
Eastman Kodak Co., Rochester, N.Y.
A. Daigger & Co., 54 West Kinzie St., Chicago, Ill.
Eimer & Amend, 3rd Ave., 18th to 19th Sts., New York, N.Y

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Prest-O-Lite Company of Canada, Prest-O-Lite Bldg., Toronto.

Coppersmiths—
Sowers Mfg. Co., 1315 Niagara Street, Buffalo.

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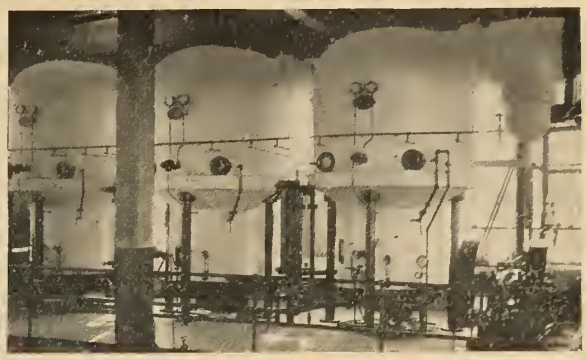

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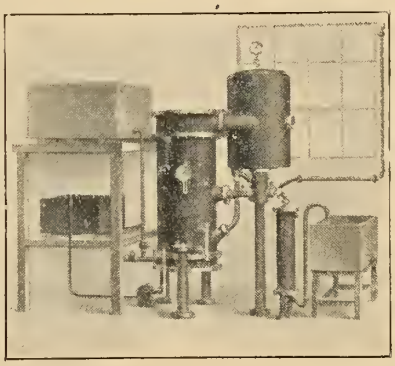

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Glycerine—
Lever Bros., Toronto.

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Eimer & Amend, 3rd Ave., 18th to 19th Sts., New York, N.Y.
McKay School Equipment, Ltd., 265 Adelaide Street W., Toronto.
Scientific Materials Co., Pittsburgh, Pa.

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Green Copperas—
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Lacquers—
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Lead, Sublimed—
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Machinery—Centrifugal—
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Machinery—Pumping—
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Mineral Resources—
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Canadian National Railways, Resources Department, Toronto.
Canadian Pacific Railway, Dept. of Colonization and Development, Windsor Station, Montreal.
The Minister of Mines, Victoria, British Columbia.

Nickel—Salts—
Deloro Smelting & Refining Co., Deloro, Ont.

Paper Trade Specialties—
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Paraldehyde—
Canadian Electro Products Co., Power Bldg., Montreal.

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Coors Porcelain Co., Golden, Colo.

Porcelain—Scientific—
Coors Porcelain Co., Golden, Colo.

Potassium Salts (Nitrate, Sulphate, Chloride)—
Nichols Chemical Co., Ltd., Toronto.

Reagent Chemicals—
J. T. Baker Chemical Co., Phillipsburg, N.J.
Mallinickrodt Chemical Works of Canada, St. Paul Street W., Montreal.
43 Scott Street, Toronto.

Salt—
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Shellac—
H. J. McAdie, 817 Power Bldg., Montreal.

Soda Ash—
Nichols Chemical Co., Toronto and Montreal.

Sodium Sulphate (Glauber's Salt)—
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Steel Sheets, Lead Covered—
Hoyt Metal Co., Eastern Ave., Toronto.

Stoneware—Acid-proof Chemical—
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Hoyt Metal Co., Eastern Ave., Toronto.

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Sowers Manufacturing Co., 1315 Niagara Street, Buffalo, N.Y.

Vacuum Pumps—
Central Scientific Co., 460 East Ohio St., Chicago.

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Valves, Fittings, Pipings Equipment—
Hoyt Metal Co., Toronto, Ont.

Valves—
Crane, Limited, Montreal, Que.

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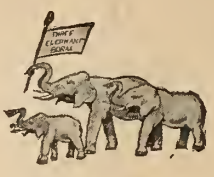
BORAX  BORAX

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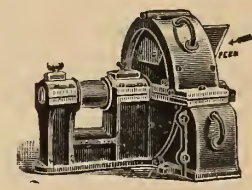

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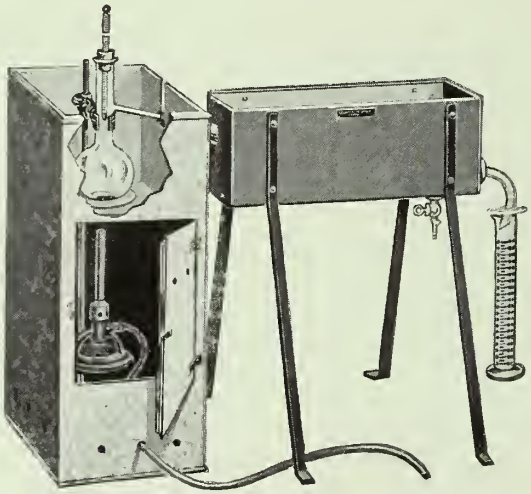
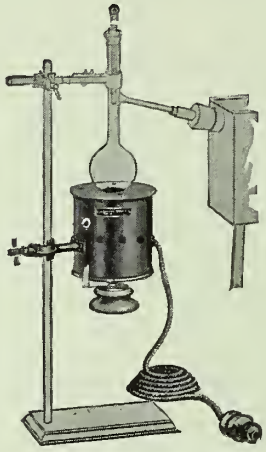


COMPLETE APPARATUS, GAS HEATED



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The Standard Distillation Apparatus for Gasoline, Kerosene and Similar Petroleum Products.

Reference: American Society for Testing Materials. Tentative Standards 1922, Pages 380 to 386.

Methods of testing gasoline and kerosene by distillation call for apparatus made to standard specifications. The S.M. Co. Distillation outfit is made exactly to these specifications, and fulfills all requirements for correct distillation.

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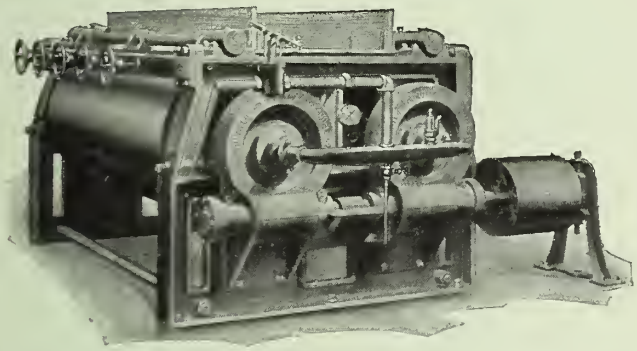
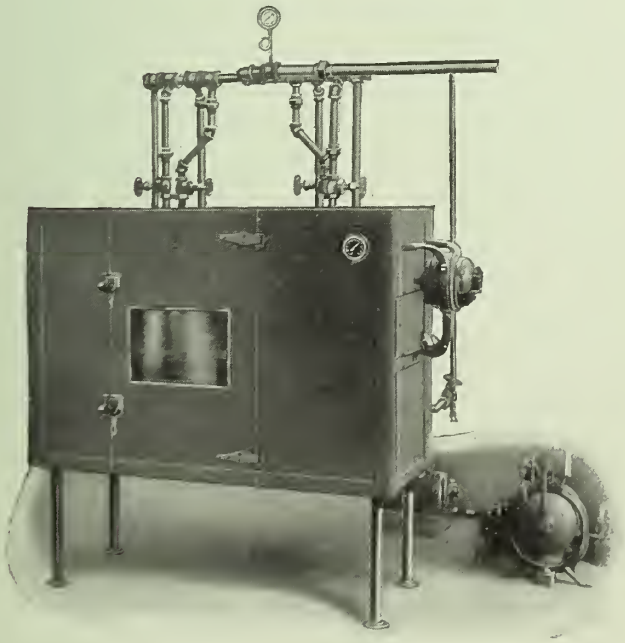
CANADIAN CHEMISTRY AND METALLURGY

Vol. VII., No. 9 TORONTO, SEPTEMBER, 1923 $3.00 a year

"BUFLOVAK" Some Recent Developments



"Buflovak" Double Drum Atmospheric Dryer with Vapor Hood and Dry Material Conveyors Removed.



"Buflovak" Cabinet Dryer. Laboratory Size. Patents Pending

BUFLOVAK Apparatus has earned an enviable reputation, that is nation wide, for dependability and quality.

A good reputation places an additional obligation on any manufacturer; for a standard once set must assuredly be maintained.

In announcing these new pieces of apparatus BUFLOVAK is mindful of its reputation; and will continue to build only equipment which measures up to BUFLOVAK standards.

BUFLOVAK DOUBLE DRUM DRYER

Is an atmospheric type dryer, designed to dry solutions of low concentration. Its extreme simplicity affords an ease of operation, as well as lowered operating costs. This type machine dries successfully such materials as buttermilk, flour paste, vegetable glues, sodium acetate, sodium naphthalene sulphonate, etc.

BUFLOVAK CABINET DRYER

Some of the more important features which this type dryer embodies are: temperature regulation as well as air flow and humidity control. It can be equipped with a patented device which automatically shuts off the steam, when any predetermined state of dryness is reached in the material being treated.

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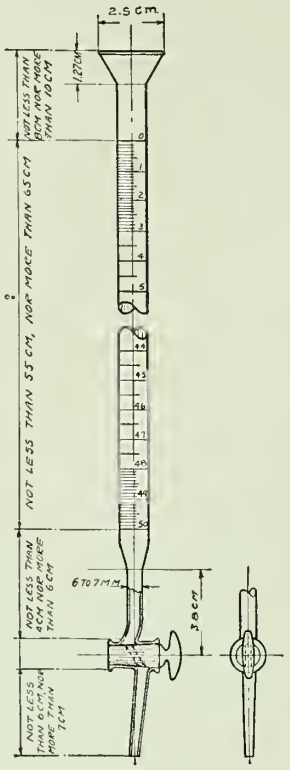
2.5 cm.
NOT LESS THAN 55 CM, NOR MORE THAN 65 CM
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6 TO 7 MM
3 CC

M C A Standard Laboratory Apparatus

As adopted by the Manufacturing Chemists' Association of the U.S.A.

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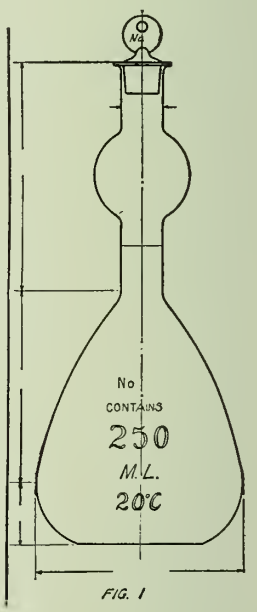

FIG. 1

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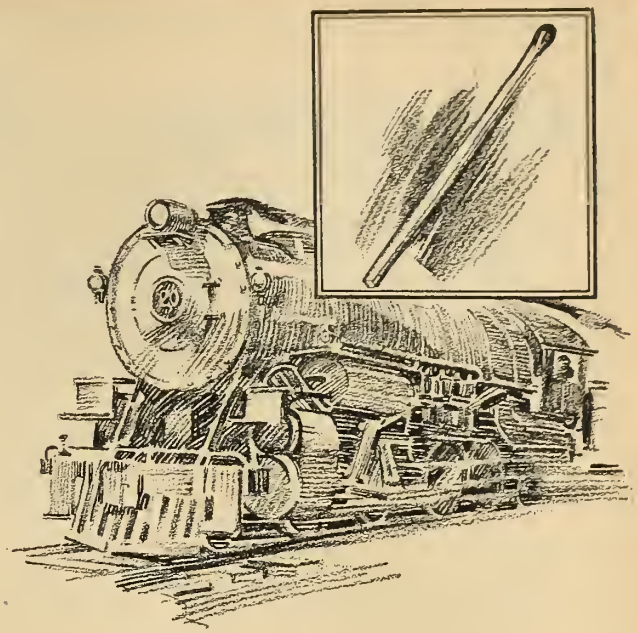

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Sept. 17th-22d 1923

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The stage is set for what will probably be the greatest display the chemical world has ever known.

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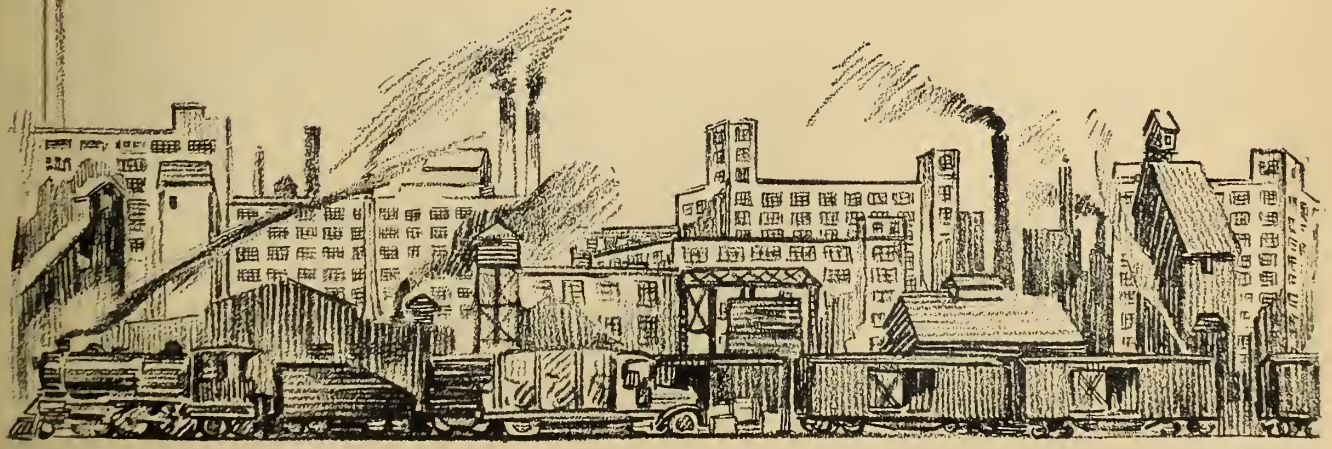


ONTARIO'S MINERALS

PROVINCE OF ONTARIO
DEPARTMENT OF MINES

Hon. Chas. McCrea, Minister. *Thos. W. Gibson, Deputy Minister.*

Preliminary Summary of Mineral Statistics

(Quantities represent shipments. Tons throughout are short tons of 2,000 pounds)

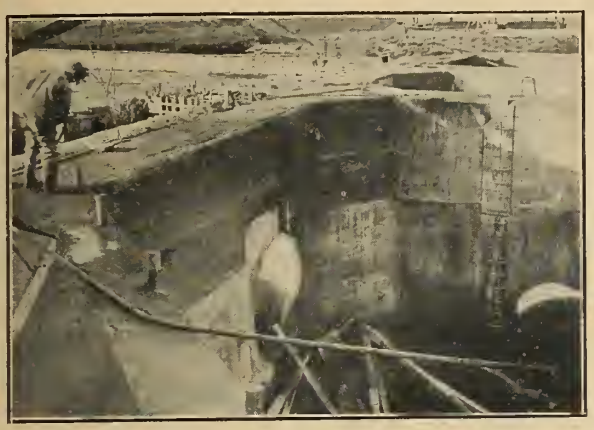
Product	1921 Quantity	1921 Value	1922 Quantity	1922 Value
METALLIC				
Gold ..... ounces	709,509	$14,624,085	$1,000,199	$20,674,109
Silver ..... "	8,412,059	5,497,160	9,167,846	6,491,271
Platinum metals (a) ..... "	915	51,060	642	38,884
Copper ..... lbs.	3,070,719	356,708	4,503,358	515,093
Nickel, metallic ..... "	5,430,147	1,825,359	11,175,326	3,171,434
Nickel, oxide ..... "	1,402,019	285,391	2,399,887	391,119
Cobalt, metallic ..... "	32,718	98,228	109,067	282,602
Cobalt, oxide ..... "	155,554	354,418	398,697	798,271
Other nickel and cobalt compounds and residues .. "	108,814	114,069	1,070,935	255,034
Copper in matte exported (b) ..... tons	3,686	737,142	7,774	1,554,731
Nickel in matte exported (b) ..... "	4,850	1,939,851	8,689	3,475,649
Iron and briquettes (c) ..... "	100	459	4,304	25,261
Iron, pig (d) ..... "	82,838	2,079,729	14,052	340,730
Lead, pig ..... lbs.	3,570,222	190,843	2,895,695	173,742
Zinc (e) ..... "	.....	.....	100,283	2,181
Total metallic	.....	$27,574,202	.....	38,190,711
NON-METALLIC				
Actinolite ..... tons	78	$ 975	$ 50	$ 345
Apatite (Phosphate of Lime) ..... lbs.	.....	.....	31	248
Arsenic, white ..... "	2,982,525	233,763	4,118,695	299,940
Arsenate of Iron ..... "	.....	.....	75,000	938
Corundum ..... tons	402	50,250	.....	.....
Feldspar, crude and ground ..... "	15,506	114,059	15,515	94,985
Fluorspar ..... "	115	1,744	284	3,905
Graphite, crude and refined ..... "	363	23,273	626	34,124
Gypsum, crushed, ground and calcined ..... "	84,765	433,053	110,227	621,668
Iron Pyrites ..... "	19,375	91,604	11,235	39,763
Mica ..... "	222	29,630	2,229	56,480
Mineral water ..... Imp. gals.	.....	9,000	31,970	6,118
Natural gas ..... M. cu. ft.	8,590,000	2,953,000	7,919,390	3,902,800
Peat ..... tons	500	2,000	3,000	14,500
Petroleum ..... bbls.	172,859	466,716	164,732	439,286
Quartz and silica brick ..... tons	12,957	74,635	82,882	149,302
Salt ..... "	149,599	1,509,287	161,551	1,537,512
Talc., crude and ground ..... "	9,967	140,390	12,874	178,397
Construction Materials—($11,527,529)—				
Cement, Portland ..... bbls.	2,723,072	6,425,266	3,104,386	6,235,370
Lime ..... tons	91,355	1,172,680	116,769	1,315,479
Sand and gravel ..... cu. yds.	1,412,956	668,098	2,132,875	1,001,088
Sand-Lime brick ..... M.	.....	456,700	48,924	770,597
Stone, building, trap, granite	.....	1,812,863	.....	2,205,025
Clay Products—($5,103,618)				
Brick, common ..... M.	99,463	1,743,094	105,536	1,803,349
Brick, pressed ..... "	31,481	673,087	44,892	900,111
Brick, tapestry or rug ..... "			22,453	514,666
Tile, drain ..... "	9,910	250,040	10,110	260,312
Tile, building and floor	.....	211,529	.....	562,566
Pottery	.....	67,985	.....	88,889
Sewer pipe	.....	939,464	.....	973,824
Total non-metallic	.....	20,554,185	.....	24,011,458
Add metallic	.....	27,574,202	.....	38,190,711
Grand Total	.....	$48,128,387	.....	$62,202,169

(a) Recoveries from Canadian and United States refineries. (b) Copper and nickel exports in the form of matte were valued, respectively, at 10 and 20 cents per pound. (c) Exports and shipments to points other than Ontario blast furnaces. (d) Proportional product from Ontario ore smelted. (e) Recovery from concentrates shipped in 1919 and not previously reported.

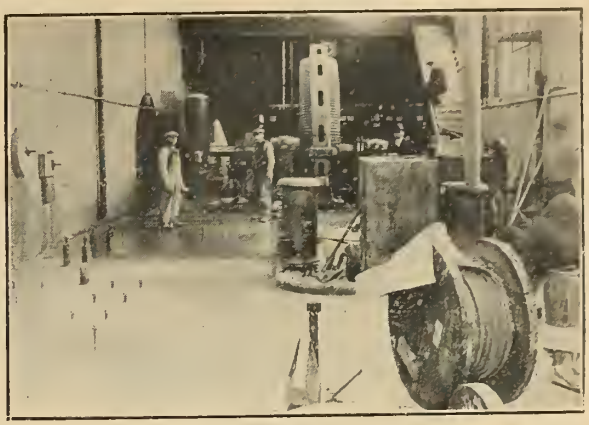
Dividends and Bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies, or a total of $114,334,884.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

For illustrated reports, geological maps, mining laws, and list of publications, apply to Thomas W. Gibson, Deputy Minister of Mines, Parliament Buildings, Toronto, Ont.



Inside of Forebay—upstream face of Breast Wall—for 1600 h.p. unit.



Interior of Power House, showing Breast Wall.

The left wall of the Power House interior is the inside of the Breast Wall which shows in the illustration on the left.

The NASSAU POWER PLANT

of the

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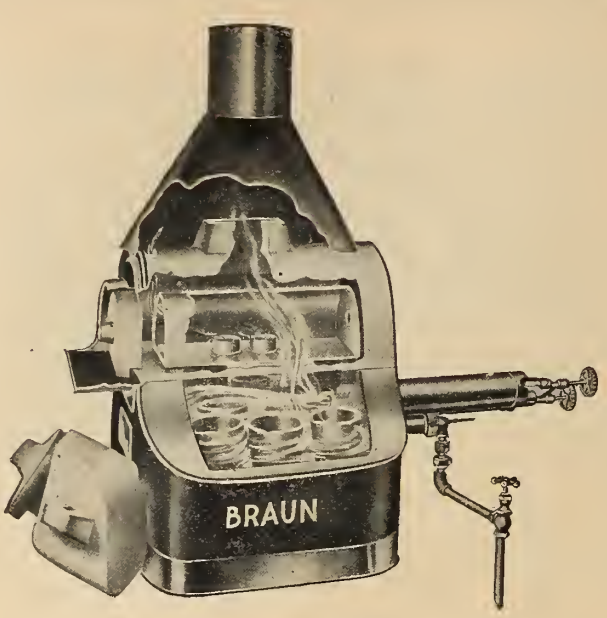

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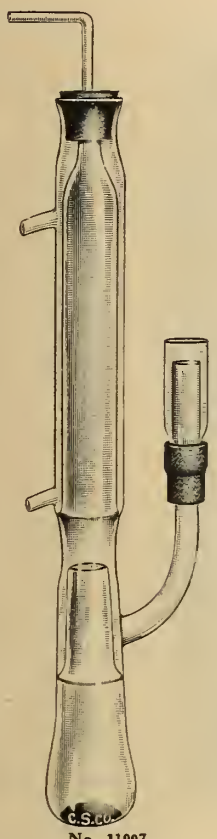

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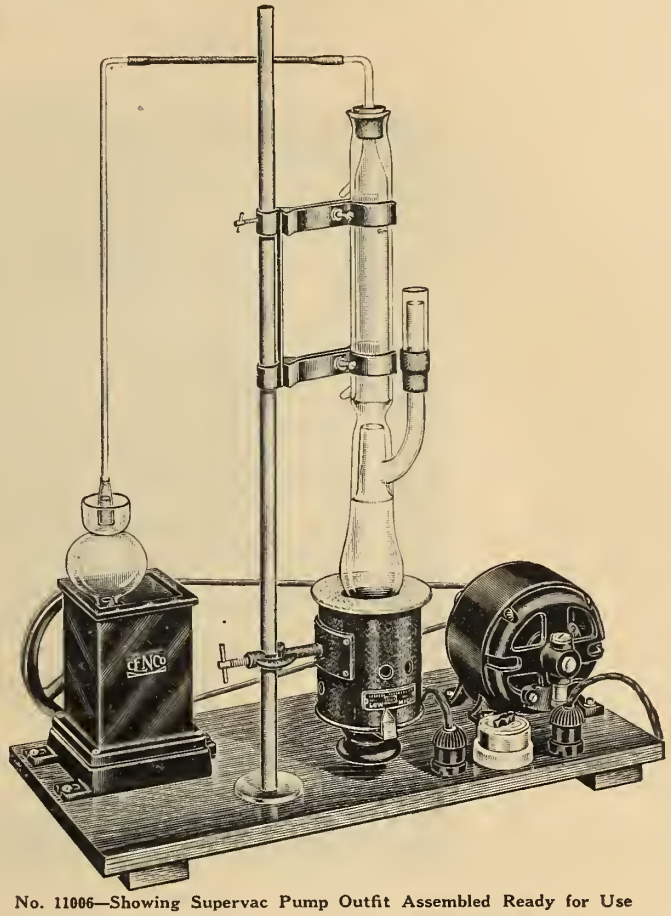

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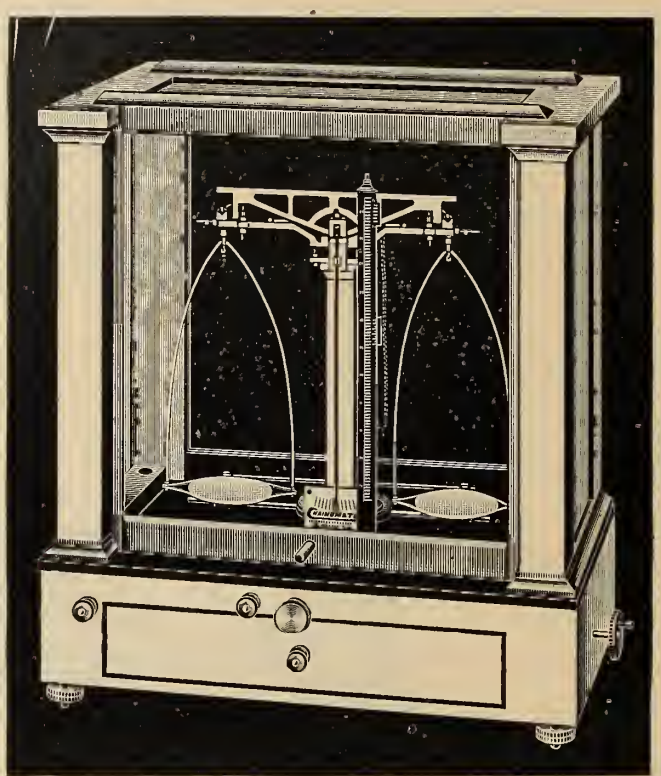

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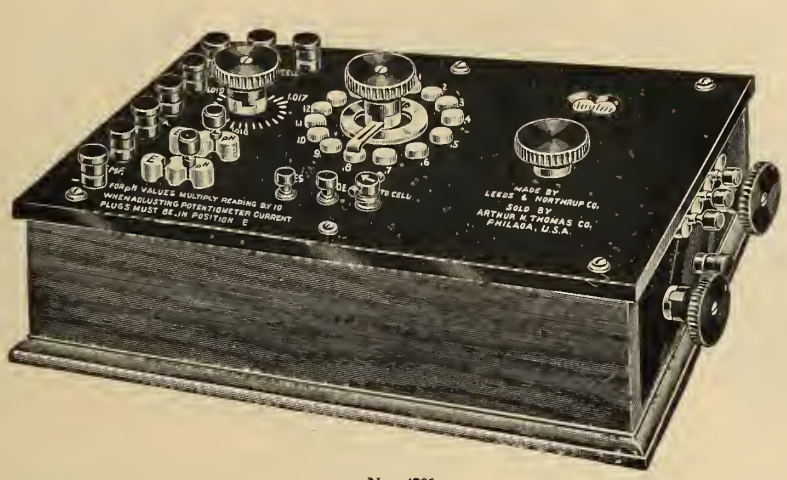

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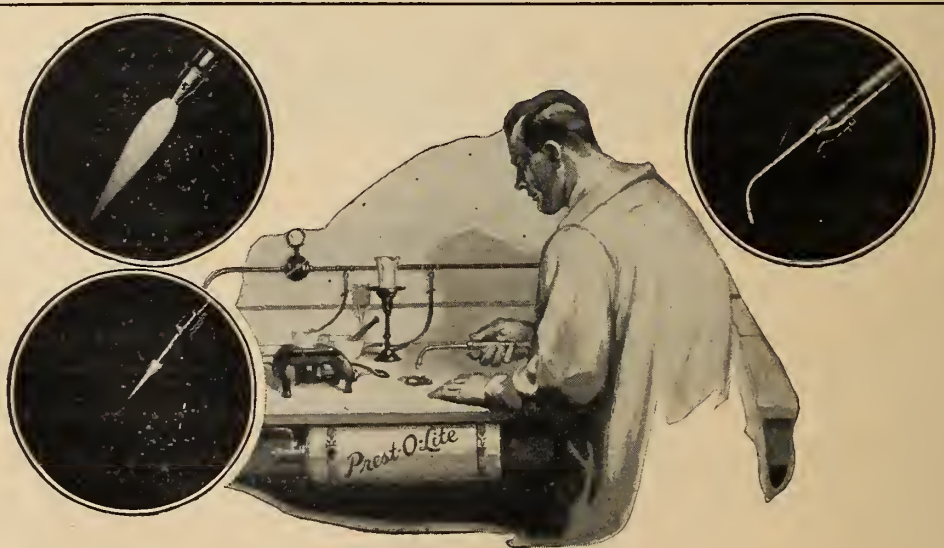

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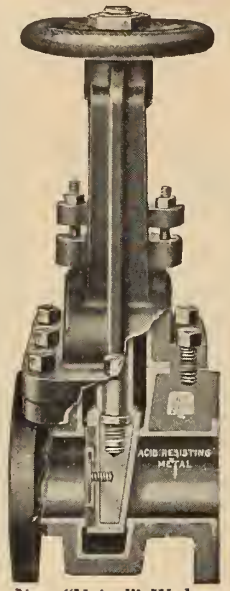

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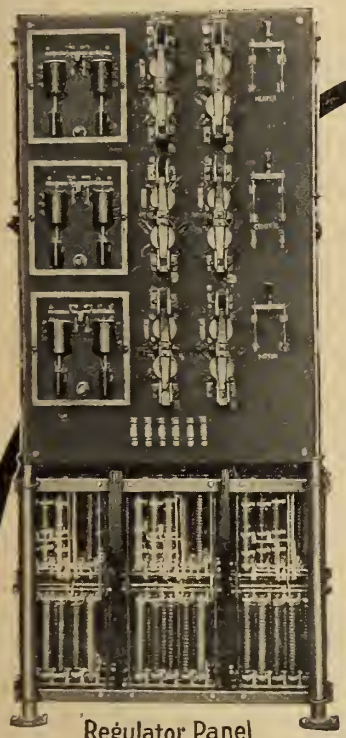

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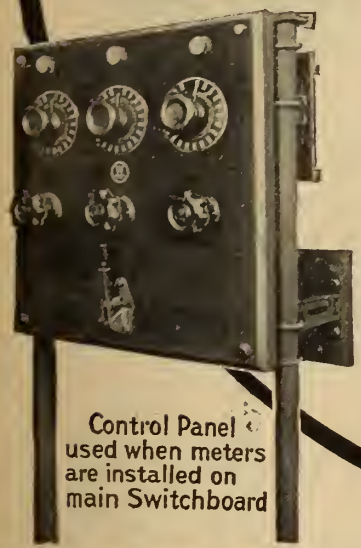

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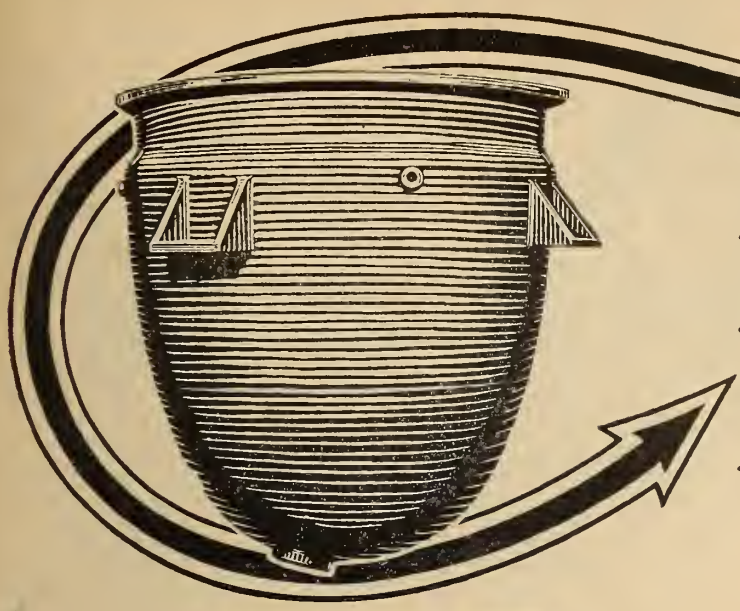

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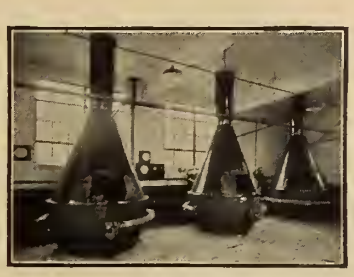

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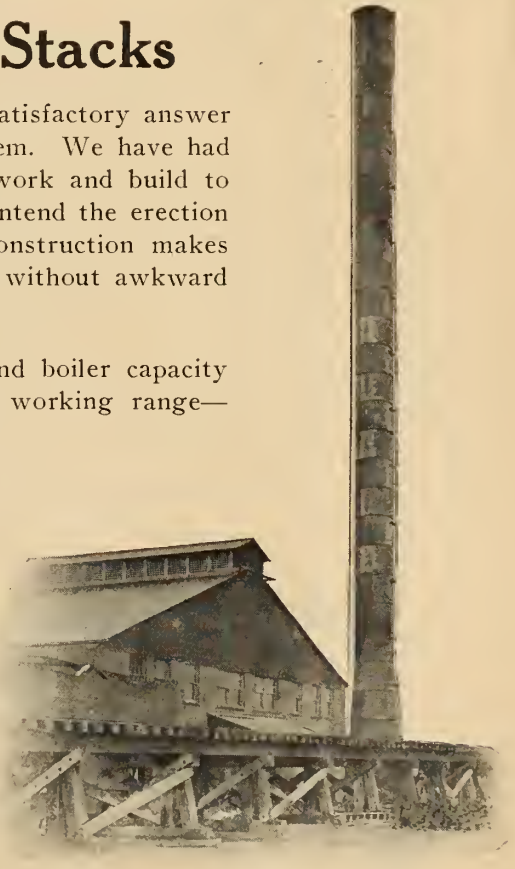

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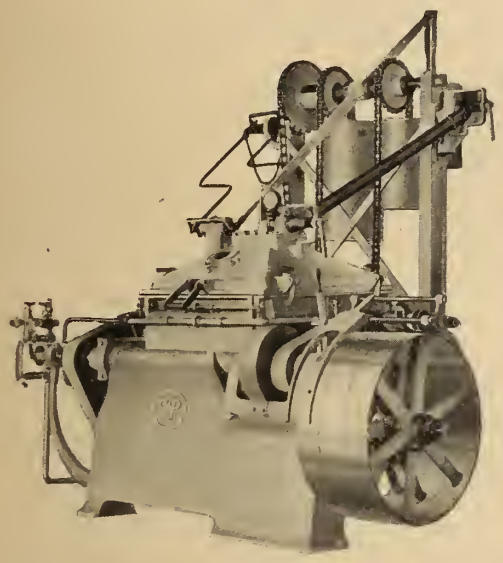

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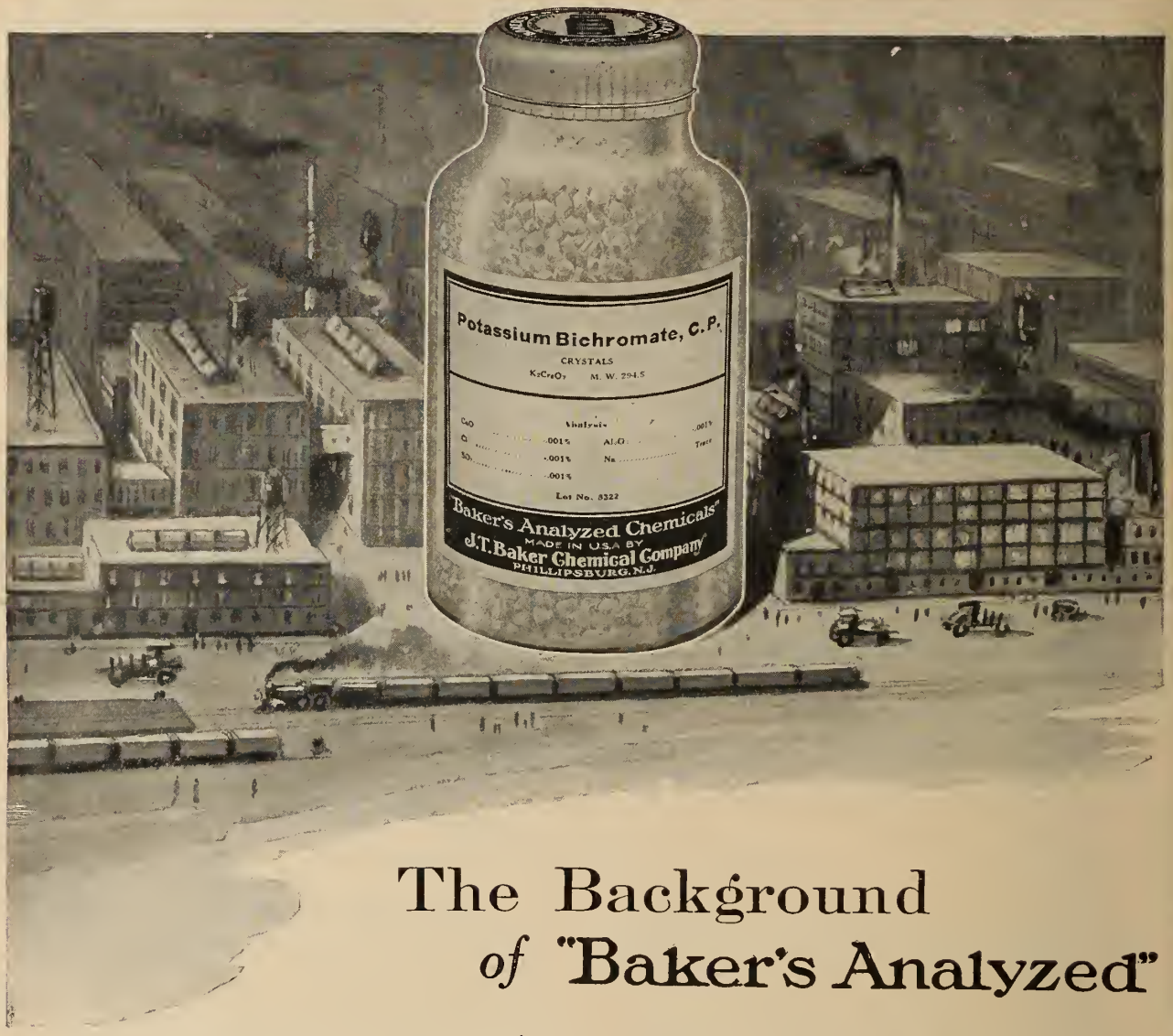

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Contents—Issue No. 39, Issued June 1st: Determination of Diastatic Strength, Malts and Malts Extracts, by Dr. C. A. Munsterman; Note on Precipitation of Copper, by A. W. Beshgetoor; Analysis of Refined Tin, by W. H. Jacobsen; Notes on Carbon Determinations by Combustion, by D. M. Strickland; Estimation of Sulphide and Thiosulphate when Present Together in Solution, by Jos. W. Coxe, Jr.; Note on Folding Filter Paper, by A. Regenbrecht.

EDITORIALS

WATCH THE MINING INDUSTRY GROW

THE challenge of President E. P. Mathewson, who is this year directing the destinies of the American Institute of Mining and Metallurgical Engineers, that we do not let the world know enough about our mining industry, was quickly taken up by the Ontario Government, when the Hon. Chas. McCrea stated that one of the things that his department was going to look after, was more publicity of the right sort.

Mr. Mathewson, being Canadian by birth, has, perhaps, more than a usual interest in seeing his native country go ahead, and certainly the recently-elected Minister for Ontario is commencing his duties with a clear sense of the great possibilities we have in that Province, and the duty of a Government Department in helping capital and technical men get at our hidden wealth.

The mining industry in Canada is not known to our agricultural interests. What it means is not realized by our people. Canada can become one of the greatest mining countries in the world. In fact, she is now in that position, but our people, as a whole, do not know enough about it to be proud of the fact.

The public mind grasps at certain romantic or spectacular things, readily. For example, the statement might be made that the asbestos industry might grow to ten times its enormous size in the Province of Quebec, without creating a ripple in either public, or Provincial Government attitude; but, if gold is found in milling quantities in Quebec, a revolution in the public conception of what the mining industry may become will set in among those who follow such affairs at all in that Province. Our various provincial governments are so busy with the handling of pressing matters relating to natural resources, that they are hardly ready, in some cases, to carry out a thorough development of anything that is less obvious. When possibilities are demonstrated, encouragement flows freely, but more knowledge of mining, and perhaps less of mining stocks, would be helpful to many.

In regard to mining laws, few realize how very fair those of Canadian Provinces really are. Stories are told of other places, where the mining industry is overburdened by local taxation. Here, anyone may come in and hold land, and develop it under very generous terms. Taxation only begins when net profits come, and then not until they exceed $10,000 per annum. After this, it is three per cent. These are Ontario regulations, and conditions are good throughout the Dominion. The Dominion Government stands prepared to assist in all problems, whether geological or ore dressing. Not content with this, we have provincial departments that compare most favorably with those of any state or territorial unit in the world.

These are facts that make it a pleasure for many engineers from all countries to guide development work in Canada, and such a policy bids fair to make the mining industry a strong rival of what is generally taken to be our national backbone, agriculture. Our ship of state needs every kind of motive power to carry her along under her present burden, and the mining industry looks like a mighty powerful assistant.

Every encouragement should be given all Government Mining departments, so that, under the wide awake guidance, they now possess they may be able to accomplish their aims, which are to survey what we have and bring in money for development. Mining men and mining interests can help in this, and it will be the essence of good business for all concerned to keep the ball rolling.

TRY BORING FROM WITHIN

"ANY assemblage of men of science, willing to face the facts, will agree that science, scientific methods, and scientific research, have not yet won that position within the realm and its industries that is requisite, if we are to maintain our place among the nations."

That quotation is from the Presidential address of Prof. E. F. Armstrong at the Cambridge meeting of the Society of Chemical Industry. Now, if the angels will step aside for a moment, we shall rush in and explain why, in our humble opinion that is the case, not only in the United Kingdom, but elsewhere.

Briefly, it is that we are endeavoring to direct operations in scientific forms of control, through individuals who lack the co-operating sense and whose general opinion, rightly or otherwise, is that we don't know what we are talking about, and that they control the operation. They have somewhat the advantage in position, and, until we have their intelligent co-operation, only slow progress will be made.

Witness, for example, a discussion in a plant, about some trouble in operation. The engineer said it was plainly due to fluctuations in the hydrostatic head. The operative said he was wrong, "Any fool could see that it was because the depth kept changing."

One way to improved relations is that of simplified language. Another is for university men to realize that industrial plants possess fascinating

pieces of productive apparatus that no laboratory could afford, and that the operation of such equipment is just as thrilling as the manipulation of beakers and stirring rods. Some men will never make successful mill-men, of course, but many others can. We have many broadly trained men in production and departmental work, but we need more of them who have it within them to rise to the top; and, in short, it is time to raise the qualifications all down the line. Let those who believe themselves highly qualified in a fundamental way and are yet unplaced or unsatisfied, get into our candy factories, bakeries, paper mills, and packing-houses, not as superior beings, but as workmen. The need is for broadly-trained men in control of, and in personal contact with, smaller units of operation.

IS ENGINEERING GOING OUT AS CHEMISTRY COMES IN?

SOMETIMES a line of thought is stimulated by considering a sequence of events which in themselves point to a tendency, but which may only be partly true when broadly examined.

Is engineering going out when we consider or define the word as relating to the design and erection of mechanical devices and large scale engineering projects? By going out no decrease in the magnitude of operations is referred to, but what is intended is rather in the way of defined limitations. In short has not the engineer fairly well demonstrated what he can do with the materials available? He may do better with new materials, but he is not a creator. By chemistry coming in, is it not true that progress is being made in a fundamental way by making available new materials and products. These may be seized upon and transformed by engineering practice. They may be coupled up with materials whose properties are well known but is there not much to be said for the way chemistry is supplying the new thing—the thing that is making progress possible?

When long distance transmission at high voltages became necessary, was it not a chemical and metallurgical problem? If artificial silk should in a few years become the cheapest of textiles through large-scale production, how much of it will be due to engineering and how much to chemistry?

Our paper mills are about as good as engineering can make them, and it is the business of chemistry to improve them and supply a new objective. And so in the oil industry, progress has become distinctly a matter of putting chemistry into refining, and the necessary engineering will follow. Perhaps in a sense this is not a new order of events, and chemistry has always led the way, although at times the results have quite overshadowed the cause. Such thoughts tend to place merit where it is due and research at the front.

Quite aside from rewards which will adjust themselves quickly when cause and effect are better realized, such thoughts should bring a feeling of considerable satisfaction to chemical workers who in any way, are contributing to the "coming in" of chemistry.

THE INSTITUTE'S MEMBERSHIP CAMPAIGN

THE Canadian Institute of Chemistry is starting in on a special drive for members during the coming months. Canada is a land where the chemists of various countries meet with those who have received their training and experience for the most part in our own industries.

As a worker for the chemical profession in Canada, the Institute is the one Dominion organization that is at all concerned with their professional well-being, or is able to bring chemists together to discuss matters of special interest.

The economic status of the chemist will be whatever he chooses to make it. His progress in industrial life depends upon his ability to sell his services to industries and increase his capacities for enlarged responsibility and leadership. The first thing is to get together. Every chemist in Canada has an interest in this matter, and a responsibility. The exercise of participation in the activities of a professional chemical institute will help to put new "pep" into your work. It will make you feel that you are not an island in an uncharted sea, but that you really belong to a well-defined group of people who have a remarkable place to fill in the world's work.

Once again, there is no need to wait until you are asked, or pressed, to make application. It is your Institute and your business to know about it. So, if your neighbor, who happens to be a member, suggests joining up, do not begin to unload your pet grievance with things in general. Just say "This thing is for Chemists working in Canada, and that means me."

DEAN GOODWIN

FEW men in University life have been more sincerely liked than Dr. W. L. Goodwin, who for thirty busy years served the mining industry of Canada from his chair at Queen's, and continues to serve it with joyous abandon in his own special way.

Dean Goodwin he continues to be, for Queen's expressed her appreciation in making him Dean Emeritus—"W. L." has been appropriated to him in some circles without competition.

At the autumn Convocation an oil portrait of Dr. Goodwin will be unveiled.

The mining and metallurgical industry of Canada owes a large measure of its successful development to the ability and unbounded enthusiasm of Dr. Goodwin as scholar, investigator and teacher.

We take this opportunity of expressing to Dr. Goodwin our sense of good fortune that we have been able at times, to share the way with him.

Correspondence.

Re the Association of Official Analysts.

Editor, CANADIAN CHEMISTRY AND METALLURGY
Dear Sir:

To one who declined appointment as an official analyst under the Fertilizers and Feeding Stuffs Acts, it is a surprise to learn from the report of the organization of the Canadian Association of Official Analysts, published in your July issue, that several Fellows of the Canadian Institute of Chemistry (some of them members of its Council), who are not connected with the Dominion Civil Service, have accepted such appointment. It would be interesting to know whether the question of a scale of fees for routine analyses has ever been considered by the Council and whether the acceptance of inadequate fees is not regarded as inconsistent with the objects of the Institute. Can "high standards in the profession" be maintained without some general understanding as to what constitutes a fair fee for such common analytical determinations as those involved in the administration of these Acts? Do Fellows of the Institute regard a fee of Five Dollars per sample as adequate for the five or six determinations required in fertilizers, viz. water-soluble nitrogen, total nitrogen, available phosphoric acid, total phosphoric acid, water-soluble potash and in some cases fineness, or for the analysis of a feeding stuff for protein, fat and fibre?

Do consulting analysts perform such analyses for such low fees? If not, is it fair, is it in the best interests of the profession, for University professors to accept positions as Official Analysts to perform such analyses on such terms? If the terms are actually uneconomical does this not amount to allowing the Government to shoulder some of its own legitimate expenses upon the Universities? If they are barely economical, does it not rob our graduates of possible openings and our students of some share of the time and attention of the Professors to which they are entitled?

It appears to me that some discussion of this question on the part of Fellows of the Institute, both those in and those out of college work, might be enlightening.

Macdonald College, J. F. SNELL.
August 8, 1923.

Ottawa, August 21st, 1923

The Editor,
CANADIAN CHEMISTRY AND METALLURGY,
57 Queen St. W., Toronto, Ont.
Dear Sir:—

In the August number of your Journal a letter appeared criticizing the newly formed society "The Canadian Association of Official Analysts." Other letters and criticisms concerning the same subject have, I believe, been received by you. Some further explanation therefore, seems desirable.

The Food and Drugs Branch, Department of Health, administered the Commercial Feeding Stuffs Act, 1909 and the Fertilizers Act, 1909 and amendments until 1920 and 1922 respectively. All of the analytical work required was performed in their laboratories by qualified men designated Public Analysts. When the Department of Agriculture took over the administration of these Acts they found themselves unable to perform the necessary chemical analytical work through lack of laboratory service. A scheme was devised therefore, whereby qualified men throughout the Dominion were appointed to act as analysts for the Department. By the Feeding Stuffs and Fertilizers Acts, these men are designated as "Official Analysts." Some declined to act owing possibly to the smallness of the remuneration, or for personal reasons. At the end of a year these "Official Analysts" were convened in Ottawa by the Department of Agriculture under the chairmanship of Dr. F. T. Shutt, Dominion Chemist, to discuss changes which might seem necessary and to present for consideration, difficulties which had arisen during this period. At the close of this meeting the above Society was organized.

The name may seem too "officious," but it was not of their choosing, as they were designated by the Acts mentioned above, "Official Analysts" and not "Official Agricultural Chemists."

Another objection raised is that some qualified men were overlooked when these appointments were made. This however, is outside the duties of the Association and is a matter of policy with the Department. The real reason is, I believe, that it was felt undesirable to have more analysts than necessary. Some, even now, state that they are receiving but little work to do.

A third point is the fee allowed by the Department. Under the former administration a charge of five dollars was made except to farmers, when the charge was one dollar per sample. It was agreed by the Official Analysts to perform these services for the fee of five dollars for the period of one year. At the expiration of this time, however, it was found that this fee was inadequate for the service rendered and it was recommended that the fees be five dollars for one determination, ten dollars for more than one and less than four, and fifteen dollars for all official samples over three determinations of feeds or fertilizers. This scale will be adopted, I understand.

These fees cover official samples only.

Yours very truly,
GEORGE E. GRATTAN,
Sec.-Treas. C.A.O.A.

117 Victoria Street, Ottawa.

SUCCESSOR APPOINTED TO LATE DR. WADDELL

Dr. Earle F. Whyte, B.A. and M.A. of Dalhousie and Ph.D. of Clark, has been appointed to succeed the late Dr. John Waddell as professor of analytical chemistry at Queen's University.

Dr. Whyte was born in Truro, N.S., and received there his common and high school education. He attended the Provincial Normal School for a year and obtained the highest teaching license given by the province of Nova Scotia. He taught high school for three years in the capacity of principal and then went to Dalhousie University where he graduated with distinction in chemistry and geology. During his senior year, owing to the death of Dr. Eben McKay, he received a temporary appointment to the staff. The following year, 1920-21 he held a bursary from the Honorary Advisory Council and at the end of the year obtained his Master's degree. The following year he was awarded a studentship from the Honorary Advisory Council, but he resigned in favor of a research assistantship at Clark University under Dr. Charles A. Kraus and obtained his doctorate, June, 1923.

TO UNVEIL PORTRAIT OF DR. GOODWIN

A life-size portrait of Dr. W. L. Goodwin, former Dean of the Faculty of Applied Science, Queen's University, is to be unveiled at the Autumn Convocation of the University. Dr. Goodwin at present is engaged in mining research work in Northern Ontario, for the Provincial Government.

Prepared Non-Metallics in Canada

Their Consumption by the Principal Canadian Industries During 1922—Possibilities For Development.

By S. J. Cook,

Chief of the Mining, Metallurgical and Chemical Branch, Dominion Bureau of Statistics, Ottawa.

WITH a view to determining the consumption in Canada of prepared non-metallics, the Dominion Bureau of Statistics, has recently carried out a survey, through its Mining, Metallurgical and Chemical Branch, of the extent of the market for a number of these commodities, particularly those used in a finely divided state. The present review is intended to set out in summary form the salient features of the investigation. More complete data may be had on reference to the Bureau's report on this subject, now in press.

The rapid industrial development of recent years has resulted in the creation of substitute markets to a very considerable extent. When a commodity in common use becomes too costly, or the extent of its availability is diminished, there immediately appears on the market, another article to take its place, and it often happens that the substitute product is found more useful than the supposedly indispensable material used for years. Particularly is this true of the prepared non-metallics; so, while the data shown in this article refer to conditions as in 1922 and early in 1923, it may easily be that a survey taken a very few years hence will reveal very considerable changes in accepted practice. Indeed, the study just completed indicates that appreciable departures have already been made from the practices reported in earlier work carried out by Government investigators.

With the exception of sulphur in the native state, whiting and some special grades of clay, Canada possesses important deposits of almost all non-metallics most commonly used in Canadian industries. By substituting new and cheap materials for many of those now imported, and with the amount of research being done, the consumption of these prepared non-metallics is bound to increase as industries develop.

The present census was undertaken with a view to rapidly securing first-hand data from the most important consumers of prepared non-metallics, omitting those industries which used the materials in the crude form. The method of securing the data was mainly by circularizing possible consumers with the list of the minerals, pointing out that most of the raw non-metallic minerals from Canadian deposits were exported from this country for grinding, to be later imported at greatly increased prices. The list of minerals covered was as follows: Actinolite, arsenic, asbestos, barytes, calcite, whiting, chromite, corundum, dolomite, feldspar, fluorspar, graphite, gypsum, kaolin, lime, magnesite, magnesium sulphate, manganese, mica, natro-alunite, iron oxides, phosphate, pyrites, silica or quartz, sodium sulphate, talc and tripolite.

A little difficulty arose in the confusion of names, for example, kaolin was not recognized as China clay, but on the whole excellent replies were received, many points of which have been embodied in the notes under each industry. The work of correspondence was also supplemented by personal visits to the largest centres where calls were made on important consumers, and also on the importers dealing in many of the materials.

More complete surveys have been made and the results published by the Mines Branch, showing all the non-metallics consumed in this country. The present review, which has been restricted to ground non-metallics will bring the more important items up to date, and supply those interested with later figures besides indicating particularly where changes in processes have affected the amounts of different materials used.

The results were compiled to show as closely as possible the number of pounds of domestic and foreign materials consumed during the calendar year of 1922, and were supplied by consumers as the average amounts used.

Heavy Chemicals Group

Replies were received from nineteen plants, eleven in Ontario, six in Quebec, and one in British Columbia. The products of these plants included sulphuric, nitric and hydrochloric acids, caustic soda, salt cake, calcium carbide, ammonia, plating chemicals, tanning chemicals and industrial gases.

The following materials were reported used by these companies:—

Asbestos Sheets	5	tons
Asbestos Powder	5	"
Barytes	60	"
Ground Quartz	120	"
Lime (CaO)	108,078	"
Limestone	175,124	"
Magnesium Sulphate	50	"
Pyrites	15,091	"
Phosphate (Rock)	26,800	"
Sodium Sulphate	15	"
Sulphur	3,339	"
Tripoli	60	"
White Arsenic	55	"
Whiting	75	"

Fertilizers

The majority of the producers did not use any phosphate and only three in Ontario , one each in Quebec, New Brunswick and Nova Scotia reported any use of this raw material. The item is not important to producers in Ontario and Quebec since the imported crude material may be laid down at any point on the St. Lawrence for as low as $9.00 per long ton.

Medicinal and Pharmaceutical Preparations

While it was not expected that the preparation of medicines, etc., would consume large quantities of any prepared non-metallics, the industry was circularized in order that some estimate might be made of future requirements for materials of higher grades than ordinarily used. A selected list of the larger firms were asked for reports—seventeen being situated in Western Ontario, nine of which were in Toronto, nine firms in Montreal, four in Winnipeg, and one each in Vancouver, St. John, N.B., and Halifax, N.S. About forty to fifty per cent. of the commodities were imported and were as follows:—

Arsenic	2,120	pounds
Graphite	100	"
Gypsum	2,000	"
Iron Oxides	600	"
Kaolin	12,604	"
Lime	6,350	"
Magnesite	1,400	"
Magnesium Sulphate	133,618	"
Silica and Tripolite	200	"
Sodium Sulphate	31,470	"
Talc	298,317	"
Whiting	23,100	"

Talc was the only important item, and of the total shown, 89,340 pounds of special talc, was imported from France and Italy. Some sixty tons of magnesium sulphate was used, and while the Canadian native salts are of an exceptionally high grade and suitable for all industrial preparations, it seems impossible for the western deposits to compete with the imported

varieties on account of high freight rates. Foreign magnesium sulphate is laid down in Western Ontario points at about $4.60 per hundred weight.

Explosives, Fireworks and Matches

With the exception of ground quartz, calcite (chalk), whiting, and phosphate, this industry did not report any important consumption of prepared non-metallics.

The calcite or chalk used was said to be supplied in a very finely pulverized condition having a value of about $10.00 per ton, f.o.b. Montreal, and $14.00 at Vancouver. The Quebec plants consumed about seventy tons of this material while about thirty tons was used at Vancouver. About 134 tons of imported whiting was used in Ontario, seventy tons for Quebec province and about ten tons in British Columbia, or a total of 214 tons for Canada. Quartz and glass in the ground form were used in the match industry to the extent of 650 tons.

About 265 tons of phosphate rock was used in British Columbia during the year.

In the explosives, fireworks and match industry, reports were received from twenty plants representing sixteen companies. The largest company operated four plants, one in Vancouver, two in Quebec, and one in Ontario. The plants reporting were, by provinces: Quebec, three explosives, two ammunition, one fireworks, one match, and one signal works; Ontario, two match, two explosives, three fireworks, and one signal works; British Columbia, three explosives works.

The Paint Industry

This industry was one of the largest users of prepared non-metallics, and during the past four years showed continuous increases in every province. It was largest in Ontario where fourteen plants were in operation, eight being in Toronto, and the balance in Western Ontario. In Quebec eleven plants were in operation, all situated in Montreal. British Columbia was represented by seven plants, five of which were in Vancouver, and two in Victoria. Manitoba had two plants, one at Winnipeg and one at St. Boniface. Nova Scotia was represented with one plant at Halifax.

The table below shows the consumption of ground non-metallics by the Canadian paint industry:—

It will be seen that whiting was the most largely used material, and as in other industries was entirely imported from abroad, either English cliff stone or the American variety, both in a very finely pulverized condition. This whiting, in comparison with Canadian calcium carbonate, is regarded as superior for the manufacture of putty and flat wall paints, since it is entirely amorphous, whereas the Canadian product is crystalline.

Some 1,500 tons of barytes in various colors was imported from the United States, England and Germany, while more than 360 tons was supplied by domestic ores.

Soap Industry

The bulk of the soap manufacturing, including washing compounds, is carried on in Montreal, and at Toronto and

TABLE SHOWING CONSUMPTION OF PREPARED NON-METALLICS BY THE CANADIAN PAINT INDUSTRY

	Ontario		Quebec		Brit. Columbia		Manitoba		Nova Scotia		Canada		Total
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	All Classes
Asbestine—													
No. of companies	5	4	5	2	1	3	1				12	9	21
Quantity.....lbs.	693,894	343,718	795,789	326,340	9,423	93,000	176,025				1-675,131	763,058	2,438,189
Barytes—													
No. of companies	1	10	1	8		6		2	1		3	26	29
Quantity.....lbs.	10,380	1,060,777	600,082	2,118,944		135,297		64,007	119,000		729,462	3,379,025	4,108,487
China Clay—													
No. of companies	1	5	2	6		1		1			3	13	16
Quantity.....lbs.	249	27,212	6,562	346,591		35,989		8,185			6,811	417,977	424,788
Feldspar—													
No. of companies			1								1		1
Quantity.....lbs.			7,000								7,000		7,000
Graphite—													
No. of companies	4	4	2	2		3	1		1		8	9	17
Quantity.....lbs.	5,483	252,192	44,880	6,023		11,564	12,591		7,600		70,554	269,779	340,333
Gypsum—													
No. of companies	1	1	1	1							2	2	4
Quantity.....lbs.	800	40,763	40,000	100,000							40,800	140,763	181,563
Iron Oxide—													
No. of companies	1	7	8	4	1	5	1	1			11	17	26
Quantity.....lbs.	30,609	163,204	1,653,423	156,288	50,000	157,702	120,535	21,250			1,854,567	498,444	2,353,011
Lime (CaO)—													
No. of companies	1	2	1								2	2	4
Quantity.....lbs.	1,000	3,200	3,500								4,500	3,200	7,700
Manganese—													
No. of companies		4	1	1		1					2	6	8
Quantity.....lbs.		4,058	2,000	2,000		1,700					2,000	7,758	9,758
Quartz-Silica													
No. of companies		10		7		5		2				24	24
Quantity.....lbs.		282,273		511,921		32,600		19,391				846,185	846,185
Whiting—													
No. of companies		12		12		7		2		1		34	34
Quantity.....lbs.		2,747,505		6,199,283		602,563		937,368		135,072		10,621,791	10,621,791

CONSUMPTION OF PREPARED NON-METALLIC MINERALS AS REPORTED BY COMPANIES OPERATING IN THE SOAP INDUSTRY

	Ontario		Quebec		Western Provinces		Total for Canada		Grand Total
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	
Feldspar—									
No. of companies				1				1	
Quantity.....lbs.				1,120,000				1,120,000	1,120,000
Fluorspar—									
No. of companies	1							1	1
Quantity.....lbs.	4,000							4,000	4,000
Iron Oxide—									
No. of companies					1		1	1	2
Quantity.....lbs.					50,000	15,000	50,000	15,000	65,000
Silica—									
No. of companies		2		1		1		4	4
Quantity.....lbs.		6,650,000		40,000		50,000		6,740,000	6,740,000
Talc—									
No. of companies	6	1	7		1	1	14	2	16
Quantity.....lbs.	86,500	10,000	100,200		25,000	60,000	211,700	70,000	281,700

other Ontario centres. Those reporting any consumption or use of the non-metallics covered in the survey, numbered thirteen in Ontario, five of which were at Toronto, two at Windsor, one at Hamilton, one at Guelph, one at London, one at Walkerville, one at Goderich and one at Perth; fourteen in Quebec, all in Montreal; two in Manitoba, one in New Brunswick and one in British Columbia.

The most important non-metallic mineral reported as used in the soap industry was ground quartz, of which over 3,000 tons, imported from the United States was used. From 500 to 600 tons of feldspar is used per year, which is also imported from the United States. Ground quartz and feldspar enter largely into the manufacture of cleansing materials. In the manufacture of soaps, these materials are not used.

The table on the preceding page shows the consumption of prepared non-metallic minerals in the soap industry:—

In addition to the items shown in the table, which were the only ones of the list reported as used, this industry consumed smaller amounts of china clay, gypsum, sulphate of ammonia and chloride of lime, borax, soda ash, ammonium chloride and pumice. The last mentioned was used in somewhat greater amounts, 125 tons having been reported by one company producing a cleanser. This material which is a volcanic ash is not produced in Canada. Small quantities of salt cake (sodium sulphate), were also used. The quartz or flint as it is sometimes referred to by manufacturers must be supplied in a high degree of fineness. The price laid down in Toronto is around $12.50 per ton. Many small consumers would use the Canadian article if of pure silica and if the source of supply could be depended upon. The grinding of quartz would appear to offer inducements to home producers.

Inks, Dyes and Colors

Of the plants which produced writing inks, dyes and colors in Canada, only four situated in Toronto reported any consumption of the non-metallic minerals under review. These companies either produced their own dry colors or used the ground materials in the preparation of particular grades of ink or ink powders and pellets.

The reported consumption amounted to 101,200 pounds of barytes, 40,000 pounds of iron oxide or red mortar color, 30,000 pounds of silica, 4,000 pounds of graphite, 2,000 pounds of gypsum, and 1,000 pounds of whiting. All these materials must be reduced to a fineness of at least 120 mesh.

Polishes and Dressings

Twelve firms in the polishes and dressings industry reported the use of non-metallics. In Ontario several companies in other industries also made small quantities of polishes as side lines. Only six firms reported using non-metallics in Ontario, three in Toronto and three in Hamilton; five in Quebec, all located at Montreal, and one in British Columbia. The most important item used was ground quartz or silex, used largely in metal polishes and dressings for suede shoes. Over 100 tons of silex was used, all imported, and which might well be supplied by home producers. Whiting was used to the extent of some thirty tons or more, part or all of which might be supplied by ground calcite. Canadian graphite or plumbago was used to the extent of about eighty-six tons of graphite and twenty tons of plumbago. The use of kaolin amounted to 27,000 pounds, iron oxide, 6,000 pounds, and of infusorial earth or tripolo, 35,000 pounds.

Pottery, Stoneware, Porcelain and Enamelware

This industry covers pottery works, porcelain manufacturing plants, the enamelling of iron and steel articles, and the manufacture of electrical insulating materials. The industry has developed considerably during the past five years and should continue to expand in size and importance. With the exception of good deposits of ball-clay, Canada produces all the primary raw materials which consist of feldspar, quartz, barytes and fluorspar.

The firms operating in Canada and from which statements were received numbered twenty-one, and were located as follows: Ontario, twelve; Quebec, six; New Brunswick, Nova Scotia and Alberta, one each.

In Ontario, of the twelve companies reporting, five produced insulators and glazed ware, four enamelled iron and steel articles, and the remainder were in the stove production industry. In Quebec of the six companies reporting, three were pottery producers and three made enamelled metal goods. The other plants were: New Brunswick, one pottery works; Nova Scotia, one metal goods; Alberta, one stoneware company.

In the production of pottery which is on the increase in

CONSUMPTION OF PREPARED NON-METALLIC MINERALS AS REPORTED BY COMPANIES OPERATING IN THE ENAMELWARE, PORCELAIN, POTTERY AND STONEWARE INDUSTRY

ITEMS	Ontario		Quebec		Nova Scotia		Canada		Grand Total
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	
Asbestos Sheets—									
No. of companies	3						3		3
Quantity lbs.	50,000						50,000		50,000
Barytes (Ground)—									
No. of companies		1						1	1
Quantity lbs.		140,000						140,000	140,000
Ball Clay—									
No. of companies		4		1				5	5
Quantity lbs.		1,960,000		1,110,000				3,060,000	3,060,000
China Clay—									
No. of companies		1		2		1		5	5
Quantity lbs.		1,000,000		30,000		1,200,000		2,230,000	2,230,000
Feldspar—									
No. of companies	7	3	1	3	2	1	8	8	16
Quantity lbs.	3,440,000	570,000	200,000	708,000	112,000	10,000	3,752,000	1,288,000	5,040,000
Fluorspar—									
No. of companies		4		3		1		8	8
Quantity lbs.		274,000		50,000		26,000		350,000	350,000
Gypsum—									
No. of companies						1		1	1
Quantity lbs.						75,000		75,000	75,000
Silica Sand—									
No. of companies		5						5	5
Quantity lbs.		240,000						240,000	240,000
Talc—									
No. of companies	2						2		2
Quantity lbs.	300,000						300,000		300,000
Quartz Flint—									
No. of companies	3	3	1	3		2	4	8	12
Quantity lbs.	440,000	900,000	160,000	784,000		19,000	600,000	1,703,000	2,303,000
Whiting—									
No of Companies		1				1		2	2
Quantity lbs.		120,000				10,000		130,000	130,000

Canada it has been pointed out that nothing is more serious than the use of a material which is not uniform in grade and composition from shipment to shipment. This applies to practically all the material entering into the formulae, but especially feldspar and ball clay. In pottery manufacturing the process of making one piece is so long that before the pieces made in one day are completed there are thousands in process, and as it is usually in the last firing that defects appear, serious losses may occur before the weakness is apparent. Feldspar used for the purpose must be ground to 100 mesh, be free from all metallics and other impurities and should fire to fine white color. In the pottery section of the industry the whole consumption of feldspar would be small, possibly 500 to 700 tons per annum. Enamelling of iron and steel materials would use not quite so much and the insulator and other electrical goods would probably use up to a couple of thousand tons if all were preparing their raw materials in Canada. At the present time some companies in the insulating ware, import prepared raw materials.

A feature of this industry is the recent expansion of the high tension insulator and small porcelain manufacturing. There are four companies now engaged in Ontario, of which three consume approximately 2,000 tons of ground feldspar with smaller quantities of quartz. A fourth company now imports its clay, feldspar and flint already mixed, but will possibly be in the market for 800 to 1,000 tons of ground feldspar and quartz when more completely developed. The enamelling of stoves is also carried on by two companies, one of which imports enamels in the form of flett which is a partly calcined mixture of silica, feldspar, borax and fluorspar.

Tanneries

As a probable field for consumption of prepared non-metallics the tanning and leather industry does not offer many inducements. One hundred and thirty-nine principal tanneries operated throughout Canada were circularized. Of these, five were located in Nova Scotia, two in New Brunswick, seventy-five in Quebec, forty-eight in Ontario, two in Manitoba, five in Alberta and two in British Columbia.

Chemicals and minerals such as sodium bichromate, sulphate of soda, chromic oxide, red arsenic, talc, hyposulphate of soda, sodium sulphide and magnesium sulphate were all used in small quantities.

Artificial Abrasives

Four companies produced artificial abrasives in Canada during 1922, including carborundum, exolon and aloxite. Of the minerals covered, only silica sand and corundum were reported as used, the totals being 18,275 tons of silica sand, about 160 tons of corundum.

Abrasive Wheels

This industry is centred in Western Ontario, there being two plants in Brantford, two in Hamilton, one each in London, Mimico, Toronto and Prescott. There is also a plant in Winnipeg, Manitoba. The products are grinding wheels and hones of different composition. The materials used are quartz flint, feldspar, clay, silica sand, garnets and whiting. The largest item used was emery, which not being produced in Canada was not included in the questionnaire. There was used, some 200 tons of crude quartz, which was crushed and graded by the manufacturers, seventy-five tons of garnets, some seventy-five to 100 tons of feldspar and a few tons of flint and whiting.

Asbestos Products

Although a large proportion of the world's supply of this product is produced in the crude fibre form and is graded in the mills of the eastern townships of Quebec province, a considerable portion of the asbestos used in Canadian industries is imported in the prepared form as asbestos shingles, paper, packing, cloth and yarn. A few industries such as the paint, rubber, roofing, electrical goods and pulp and paper use it as a raw material, but with the exception of the roofing industry which uses considerable quantities of asbestos sand, the amounts are not great.

The firms producing asbestos goods or materials in which asbestos was the chief constituent numbered ten in all, of which five were located in Ontario, one each being in Toronto and Peterboro, and three in Hamilton; of the remaining four, two were in Montreal and one each in Vancouver and Halifax.

The following table does not show all the raw materials used in this industry, but merely those more common to Canada.

Province	Asbestos Corrugated Paper, Sq. Feet	Crude Asbestos Fibre, Paper, Asbestine Pounds	Cloth and Yarns, Packing, Pounds
Ontario (6 plants)	21,250	121,176	120,609
Nova Scotia, Quebec and B.C.	150,000	1,212,500	6,000
Total for Canada	171,250	1,333,676	126,609

The Rubber Industry

The rubber industry which is centred principally in Montreal, Toronto, and a few Western Ontario points, consumes a large and varied list of minerals and chemicals. Much experimenting has been carried on with a view of finding new and cheaper substitutes for commodities now imported and with the progress of time, this industry will prove a market of growing importance. Of the twenty-five rubber companies in Canada producing tires, rubber goods and footwear, eight in Ontario and five in Quebec reported some consumption of the non-metallics under review. Five of these companies were in Toronto and three in Montreal.

Of the quantities shown in the table, only those for barytes, china clay, iron oxide, lime and whiting are greater than one hundred tons; of these, whiting which reaches a total of over 2,200 tons appears to be the only one for which Canadian producers might endeavor to supply substitutes. Barytes which totals 320 tons is practically all imported from the Southern States where the supply is large and the excess amounts are usually exported at low price. Both these materials are used as fillers or for weighting. Feldspar, dolomite and natro alunite are considered by some rubber companies as being useful as fillers provided they could be received in a very finely powdered condition (350 mesh). Canadian samples of both dolomite and calcite are being tested, and if properly prepared, and both satisfactory and cheap will in part take the place of both whiting and silica. The same might be said of fluorspar and dead-burned gypsum, finely pulverized as possible, which may be used as substitutes. The practice in the rubber industry varies considerably depending in part on the class of goods turned out. A few companies stated that it would be impossible to use either ground Canadian calcites or dolomites on account of the crystalline structure. The market to-day, if successful substitution was obtained, would probably be in the neighborhood of 1,000 to 1,200 tons of materials to be used as fillers.

Oilcloth and Linoleum

This industry is carried on entirely in Montreal, and is represented by only two firms at the present time. The consumption of non-metallics which is large, and nearly all of which is imported comprised 4,172,744 pounds of whiting, 64,874 pounds of barytes, 356,400 pounds of iron oxide and 720,000 pounds of Georgia limestone. All these materials were reported as used in a very finely pulverized state and the field upon further development might offer a market for ground Canadian materials. For instance, some grades of ground calcite might be used in place of the Georgia limestone. While there is now no substitute for whiting which is the principal constituent of linoleums,

CONSUMPTION OF PREPARED NON-METALLIC MINERALS AS REPORTED BY COMPANIES OPERATING IN THE RUBBER INDUSTRY
Ontario, 8 companies; Quebec, 4 companies; Total 12 companies

ITEMS	Ontario		Quebec		Canada		Grand Total	Average Price, Toronto Per lb.
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign		
Asbestos Powder—								
Number of companies	3				3		3	
Quantity lbs.	75,974				75,974		75,974	2.1c.
Asbestos Fibre—								
Number of companies	1				1		1	
Quantity lbs.	1,600				1,600		1,600	4.9c.
Barytes—								
Number of companies		6	1	2	1	8	9	
Quantity lbs.		757,229	1,526	202,200	1,526	959,429	960,955	1.5 to 2c
China Clay—								
Number of companies		1		2		3	3	
Quantity lbs.		60,000		303,278		366,278	366,278	2.2c.
Fossil Flour—								
Number of companies		1				1	1	
Quantity lbs.		6,000				6,000	6,000	5.2c.
Graphite—								
Number of companies	1	2			1	2	3	
Quantity lbs.	2,000	68,610			2,000	68,610	70,610	5.2c.
Gypsum—								
Number of companies	1				1		1	
Quantity lbs.	2,000				2,000		2,000	
Iron Oxide—								
Number of companies	1	6	1	3	2	9	9	
Quantity lbs.	55,000	141,306	20,000	93,364	77,000	234,670	309,670	3.8 to 14.5
Lime (Hydrated)—								
Number of companies	6	1	3		9	1	10	
Quantity lbs.	126,300	50,400	74,200		200,500	50,400	250,900	1.1c.
Mica (Ground)—								
Number of companies	5	2			5	2	7	
Quantity lbs.	39,440	4,300			39,440	4,300	43,740	3.8 to 9.4c
Magnesium Carbonate—								
Number of companies		1		1		2	2	
Quantity lbs.		12,000		10,000		22,000	22,000	10.5c.
Magnesia Powder—								
Number of companies	1	1		1	1	2	3	
Quantity lbs.	1,800	15,000		40,000	1,800	55,000	56,800	4.8c.
Pumice—								
Number of companies		1				1	1	
Quantity lbs.		2,000				2,000	2,000	6.3c.
Quartz Silica— (Ground)								
Number of companies		1				1	1	
Quantity lbs.		80,000				80,000	80,000	
Sodium Sulphide—								
Number of companies	1	1			1	1	2	
Quantity lbs.	12,567	7,854			12,567	7,854	20,421	
Talc—								
Number of companies	5	1		3	8	1	9	
Quantity lbs.	646,360	55,000		137,196	783,556	55,000	838,556	1.3c.
Whiting—								
Number of companies		8		2		10	10	
Quantity lbs.		2,261,914		2,200,000		4,461,914	4,461,914	1.2c.

CONSUMPTION OF PREPARED NON-METALLIC MINERALS AS REPORTED BY COMPANIES OPERATING IN THE ROOFING INDUSTRY

Material	Ontario	Quebec	British Columbia	Canada
Actinolite—				
Number of companies	1			1
Quantity lbs.	100,000			100,000
Asbestos—				
Number of companies	1			1
Quantity lbs.	181,000			181,000
Asbestos Sand—				
Number of companies	1			1
Quantity lbs.	118,200			118,200
Asphalt—				
Number of companies	2	1	1	4
Quantity lbs.	12,912,456	6,190,000	2,192,000	21,294,456
China Clay—				
Number of companies		1		1
Quantity lbs.		200,000		200,000
Dolomite (Ground)—				
Number of companies	1			1
Quantity lbs.	2,509,806			2,509,806
Feldspar (Ground)—				
Number of companies	1			1
Quantity lbs.	42,344			42,344
Magnesite (Ground)—				
Number of companies	1			1
Quantity lbs.	637,772			637,772
Marble Dust—				
Number of companies	1			1
Quantity lbs.	2,100			2,100
Mica (Ground)—				
Number of companies	1	2		3
Quantity lbs.	80,000	488,000		568,000
Silica Sand—				
Number of companies	3	1		4
Quantity lbs.	1,792,550	1,800,000		3,592,550
Slate Granules—				
Number of companies	2	2	1	5
Quantity lbs.	8,964,000	12,270,000	64,000	21,298,000
Talc—				
Number of companies	3	2		5
Quantity lbs.	716,705	884,000		1,600,705

CONSUMPTION OF A SELECTED LIST OF PREPARED NON-METALLICS IN TONS BY PRINCIPAL CANADIAN INDUSTRIES
Tons 2,000 Lbs.

	Actinolite	Barytes	Calcite	Whiting	Chromite	Corundum	Feldspar	Fluorspar	Lime	Mica	Quartz, Silex, Flint	Silica Sand	Tripolite
Acids, Alkalies and Salts	.....	60.0	.....	75.0	.....	.....	.....	.....	850.0	.....	120.0	.....	60.0
Explosives, Fireworks and Matches	.....	.....	100.0	134.0	.....	.....	.....	.....	.....	.....	650.0	.....	0.1
Medicinal and Pharmaceutical Preparations	.....	.....	.....	11.5	.....	.....	.....	.....	3.1	.....	.....	.....	.....
Paints, Pigments and Varnishes	.....	2054.0	.....	5310.0	.....	.....	3.5	.....	4.0	.....	423.0	.....	.....
Soaps, pounds	.....	.....	.....	.....	.....	.....	560.0	2.0	.....	.....	3370.0	.....	.....
Inks, Dyes and Colors	.....	50.6	.....	0.5	.....	.....	.....	.....	.....	.....	15.0	.....	.....
Polishes and Dressings	.....	.....	.....	30.0	.....	.....	.....	.....	.....	.....	111.3	.....	17.5
Enamelling Porcelain and Potteries	.....	70.0	.....	65.0	.....	.....	2520.0	175.0	.....	.....	1151.5	300.0	.....
Pulp and Paper	.....	.....	.....	‡699041	.....	.....	.....	.....	73165.0	.....	10.0	.....	.....
Rubber Goods	.....	480.4	.....	2231.0	.....	.....	.....	.....	125.4	21.8	40.0	.....	4.0
Tanneries	.....	45.0	.....	.....	.....	.....	.....	.....	4000.0	.....	.....	.....	.....
Artificial Abrasives and Abrasive Wheels	.....	.....	.....	.....	.....	160.0	100.0	.....	.....	.....	*275.0	18275	.....
Roofing and Mineral Walls	20	59.1	1.0	.....	.....	.....	21.2	.....	.....	284.0	.....	1796	.....
Oilcloth and Linoleum	.....	32.4	.....	2086.0	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wallpaper	.....	60.0	.....	.....	.....	.....	.....	.....	.....	200.0	.....	.....	.....
Glass Manufacturing	.....	.....	.....	.....	.....	.....	53.0	50.0	3403.0	.....	.....	56730	.....
Miscellaneous	.....	25.0	.....	247.0	40.0	.....	425.0	.....	303.0	†61.0	243.0	1303	.....
TOTAL	20	2936.5	101.0	10,539.5	40.0	160.0	3682.7	227.0	81855.5	566.8	6408.8	78404	81.6

*Includes 75 tons crushed garnets and 200 tons crude quartz.
†Includes 26 tons sheets and 35 tons ground mica.
‡lbs.

it would be of advantage to have a raw material which would absorb less oil than the foreign imported whiting.

Roofing

As a field for the consumption of Canadian materials, the manufacture of roofing is fairly important. There were in Ontario seven firms producing roofing of various kinds, three in Quebec, three in New Brunswick, and one in British Columbia. Of these fourteen concerns, only eight used surfacings such as silica sand, talc, ground mica, slate, asbestos sand, feldspar, marble dust, actinolite and magnesite.

The most important item in the table which Canadian producers would have difficulty in supplying is silica sand, which is mainly imported from Illinois or Michigan. The grade of sand supplied from these states is of a very high silica content and is free from dust or other impurity. It is laid down in Western Ontario points at from $5.50 to $5.65 per short ton. Users of this article do not see any objection to silica sand produced by grinding, but have met such difficulties as unevenness of grade and also dust. With such operators who depend on standardized raw materials, home producers must be in a position to supply quantities of a standard grade all the year round. With the exception of china clay and the bulk of the silica sand, all the other commodities are being supplied by Canadian mills. Mineral floors, stucco and plaster board manufacturing is expanding in Canada, and with the progress of building, will use increasing amounts of the non-metallics in the ground or broken state. Prominent among these are asbestos sand, dolomite sand, feldspar, marble dust. At the present time magnesite is being imported from India in a small way, the Canadian variety on account of the high content of lime being unsuitable. Efforts are being made to eliminate the lime in Canadian magnesites which may be successful. Magnesium chloride which is a constituent of some stuccoes is not yet produced in Canada, and must be imported from the United States.

Wallpaper

In Canada four firms manufacture and produce wallpapers, two of which are located in Montreal and two in Toronto.

The industry is not important as a possible market for prepared Canadian non-metallics. In 1922 there was consumed some 3,000 tons of china clay, all of which was imported, and about 190 or 200 tons of ground white mica. This industry was the only one reporting the use of white mica and although the raw product is found in Canada, no grinding or preparation of the same has been done. Barytes is also used as a filler to the extent of fifty to sixty tons, all of which is imported in the ground form.

Conclusion

The foregoing review touches only the more important features of the survey and indicates only in a very sketchy way the extent of the market in Canada for those non-metallic minerals that are used in a finely comminuted form. The study will be continued as contributing to the general knowledge and as a possible source of information leading to the development of new industrial ventures intended to meet domestic needs.

REPORTS RECEIVED

"National Research Council—Circular 44"

Circular 44, issued by the National Research Council of the United States is the latest publication of the Council dealing with Fire and Research Chemicals. It is compiled for the Committee on Research Chemicals by Clarence J. West and gives an idea of the large number of fine and research chemicals now manufactured in the United States, and indicates that American manufacturers are attempting to build up a real chemical industry. The circular gives a list of the fine and research chemicals manufactured in the United States, each chemical being numbered to correspond with the number of the company making it in the list of manufacturers also included. Lists of biological stains and indicators, vital stains, and hydrogen iron indicators are also treated in similar manner. The price of the circular is fifty cents, and may be obtained from the National Research Council, Washington, D.C.

"Coal, Coke and By-Products—British Empire, 1919-1921"

British Commonwealth Publishers, Ltd., Montreal, Toronto, Ottawa, Winnipeg. Price 4s. 6d, post paid. Giving complete details in statistical form of the world's production of coal, and of the production of coal, coke, and by-products in the British Empire.

"Tin, British Empire and Foreign Countries, 1919-1921"

British Commonwealth Publishers, Ltd., Montreal, Toronto, Ottawa, Winnipeg, price 1s. 7d, post paid. Giving all details concerning production, exports and imports.

"An Occurrence of Iron on Lake Athabaska"

By Professors J. A. Allan and A. E. Cameron of the University of Alberta, being Part II of the 4th annual report on the Mineral Resources of Alberta, 1922, Scientific and Industrial Research Council, Province of Alberta, Edmonton, Alberta.

THIRD ANNUAL REPORT, RESEARCH COUNCIL OF ALBERTA

This report covers the work done under the direction of the Scientific and Industrial Research Council of Alberta, during the year ended December 31st, 1922. The Council is composed of: Hon. Herbert Greenfield, Provincial Secretary; Dr. H. M. Tory, president of the University of Alberta; J. T. Sterling, chief inspector of Mines, Alberta; J. A. Allan, geologist, University of Alberta; N. C. Pitcher, mining engineer, University of Alberta; and Edgar Stansfield, honorary secretary. The Council has a permanent staff of six under its direction, composed of Edgar Stansfield, research engineer, fuels; K. A. Clark, research engineer, road materials; K. T. Hollies, assisted engineer. fuels; S. M. Blair, assistant engineer, road materials; J. B. Coghill, recording secretary; H. D. Moon, laboratory assistant.

In addition to the above, Professors J. A. Allan, and N. C. Pitcher are in permanent charge of research work in geology and mining engineering, respectively. Other members of the University staff, notably Professors Kelso, Robb, Wilson, Cameron and Morrison are giving assistance from time to time.

Naturally the Council's chief work has to do with Alberta coal and in this connection much very valuable work has been accomplished. A new laboratory method was devised for testing coals before and after storage and has proved unexpectedly successful for determining the loss of heat value of coal during storage. Systematic tests with house heating furnaces have been carried on and methods and equipment considerably improved. In particular, a calorimeter has been devised and constructed for measuring the efficiency of operation of a hot-air furnace.

Work is proceeding on the carbonizing of lignite, and a big step was made when it was shown that raw lignites could be satisfactorily dried and carbonized in one process. As illustrating the work done on fuels, it is interesting to note, that some seventy samples have to be taken, prepared and tested in the chemical laboratories in the regular routine work on a single carload of domestic coal.

In connection with road materials as stone and gravel are not as a rule available, attempt is being made to use asphalt from the bituminous sands of the province. A satisfactory method of extracting the asphalt has been worked out, and good laboratory results have been obtained in producing stable bitumized soil mixtures in connection with the study of the stabilizing action of the asphalt when incorporated into prairie roads. A full account of the work done in co-operation with the City Engineer of Edmonton on the use of the asphalt for city street paving is given in the report.

The work on fuels, road materials, geology, etc. is described in detail in the report, copies of which may be obtained from the Council.

LARGE INCREASE SHOWN IN PRODUCTION OF HEAVY ACIDS AND COMPRESSED GASES DURING 1922

According to recent statistics from the Dominion Bureau of Statistics, the value of acids, alkalies, salts and compressed gases, manufactured in Canada during 1922, amounted to nearly $17,600,000, an increase of more than $4,000,000 over the value of the output of 1921. The production of sulphuric acid was 67,280 tons (an increase of more than 20,000 tons), valued at $1,390,000. The total production of compressed gases (including oxygen, acetylene, carbon-dioxide, anhydrous ammonia and hydrogen) was valued at $2,000,000.

If possible, plan to attend the National Exposition of Chemical Industries, New York, week of Sept. 22nd. You will never regret it.

SYMPOSIUM ON ELECTROCHEMISTRY OF GASEOUS CONDUCTION WILL FEATURE MEETING OF AMERICAN ELECTROCHEMISTS

A symposium on the electrochemistry of gaseous conduction will be a leading feature of the Forty-fourth Meeting of the American Electrochemical Society to be held at Dayton, Ohio, September 27th, 28th and 29th, 1923. The symposium will be held on the opening day, September 27th, and on the evening of the 28th when a lecture will be given on the subject by Dr. H. B. Wahlin of the University of Wisconsin.

In addition to the symposium, there will be other papers and discussions, including "Electric Furnace Brass Foundry Practice"; "Development and Future of Electrodeposition"; "Organic Electrochemistry"; and "Utilization of Chlorine."

In connection with the symposium it is pointed out that until recently electrochemists have largely neglected the study of the phenomena of the conduction of electricity in gases. This neglect is very striking in contrast to the careful study, and attention to minute detail, given to the electrochemistry of solutions. Electrolytic dissociation, ionic mobilities, electrode potentials, primary and storage cells, polarisation, cathodic and anodic processes, electroplating, organic electrochemical preparations, passivity of metals, electrolytic rectification, anode materials, molten electrolytes, and the electrical behaviour of colloids, are discussed in most of the modern textbooks of electrochemistry. But an examination of 23 textbooks of electrochemistry shows that only one of them discusses the phenomena of the electric discharge in gases, other than the production of high temperatures with the arc and the formation of nitric oxides and ozone. Only eight of these books mention the formation of ozone and only eight mention the formation of nitric oxides. So, in spite of the extensive literature on the physics of gaseous conduction, electrochemists have not given space in their textbooks to the theories of gaseous conduction in its relations to the atomic structure, properties, composition, and changes in composition of the gases involved.

It is the object of the symposium to collect for discussion and reference a group of papers on the chemically important phases of, and recent developments in, gaseous conduction and thus to call the attention of chemists to a field, which has been fruitful in the hands of the physicists.

Any Canadian chemists, who could arrange to be in Dayton, would undoubtedly find very much of value in the various papers and discussions. The meetings are open to all interested.

NEW BOOKS REVIEWED

"The Chemistry of Leather Manufacture"

By John A. Wilson. Chemical Catalog Co., New York. 292 pages. Price $5.00

A very complete review of the problems of the industry and the way chemistry is being applied to them. An up-to-date summary of chemical knowledge, as related to leather.

The book will be most helpful and stimulating to leather chemists, and a good reference for others.

"Oilmen's Sundries and How to Make Them"

Scott, Greenwood & Son, London, E.C. 4. Price $1.25

This is a book of recipes, containing formulae for polishes, laundry preparations, paints, stains, printers' sundries, inks, adhesives and lubricants. Directions are given very intelligently.

"Wood Distillation"

By F. F. Hawley. Chemical Catalog Co., New York. Price $3.00

The book gives a very full account of plant practice and refining, as carried on in the best arranged plants.

Diagrammatic Motion Slides

A New Method of Illustrating Chemical Principles by Producing a Controlled Motion Picture Effect with Special Projection Apparatus.

By Brother Gabriel, M.Sc., A.C.I.C., *Science Specialist,*
De La Salle Collegiate, Toronto, Ont.

"THE eyes are the windows of the soul"—they are more: they are the avenues through which our fixed and lasting impressions enter and register themselves upon the mind. So clearly has this conclusion been perceived by educationalists of the last few decades, that many radical changes have been inaugurated in the methods of lesson presentation.

Prominent among these developments is the use of pictures illustrating the printed matter of books and the ever increasing use of projected pictures, either in the form of stereopticon slides or the animated images produced by the cinematograph or moving picture machine. Little of this, however, has been of value to the teacher of physics and chemistry. Although still slides have been prepared, to a slight extent, in the form of cross sectional diagrams, they have been lacking in the all-important feature, namely, that they do not show the diagram in action. This defect has been overcome, it is true, by carefully prepared films which shall be discussed later. Suffice it to say, that although they have remedied the trouble, they have done so only at a prohibitive cost.

In order to fill up this need the writer has conceived the idea of preparing what he has called Diagrammatic Motion Slides. It is the purpose of this article to give a short explanation of such slides.

The Nature of Diagrammatic Slides

The question naturally arises—what is meant by Diagrammatic Motion Slides? It is a name given to a series consisting, at present, of some fifty-five slides to which it is intended to add as the occasion arises. Besides still slides giving a cross-sectional diagram illustrating the arrangement of the parts in many machines and apparatus used in physics and chemistry, there are included in the series pairs of slides so designed that, when they are properly projected on the screen by a dissolving lantern, the action of the machine is perfectly portrayed.

Realizing that the idea of a universal remedy has never existed save in theory, the writer does not contend that his invention has entirely solved the problem. It has its limits as well as its possibilities. To take an example—a machine whose motion falls into three or more phases lies beyond the scope of Diagrammatic Slides. However, anything which can be illustrated by a two-phase action—and nearly every machine of elementary physics is of this class—can, by means of the optical illusion produced, be demonstrated with all the reality of the moving picture machine. Neither can it replace the actual working model. But experience has shown that suitable models are hard to obtain and usually prohibitive in price. At any rate, a diagram is necessary to bridge the transition from the model to the note-book.

Before describing how Diagrammatic Slides are made, it will be well to make a few observations as to the proper conception of diagram drawing. Science teachers are by no means unanimous on this point. Some contend that diagrams should be as nearly like the instrument as possible even to the extent of showing perspective and shading. As a result we find these "pretty" diagrams forcing their way into our text-books. Others—and to this class the vast majority belong—are in favor of simplified cross-sectional diagrams devoid of any decoration. The writer is quite willing to cast his lot with those who believe that decorations and perspective views, instead of helping the student to understand the principle, only tend to distract. He is, however, in favor of good form and true proportions and believes that the acid test to be applied to any diagram is, "will it work?"

How Slides are Made

In the explanation of the making of Diagrammatic Slides attention will be confined to the pairs of slides which convey the idea of motion. The principles underlying the other part of the series have been fairly well pointed out above. Accuracy is the all important factor in the drawing of such slides. Two outlines, including all stationary parts, are first drawn on two sheets of paper. These outlines must be so similar that they will coincide absolutely. This can best be done by first making one diagram and then, by means of carbon paper, producing its facsimile on a similar sheet of paper. In these two outlines the moving parts are then inserted in their proper positions so as to illustrate the action in two opposite and successive phases. For example, in the case of the common pump the two similar outlines are made including the cylindrical barrel, the reservoir or well, the pipe leading from the barrel to the well and the spout. In one of these outlines a piston, with its closed valve, is inserted near the top of the barrel; while the other valve, which is open, is shown at the bottom. The water is represented as running out the spout. In the other, the piston, with its open valve, is near the bottom and the valve at the bottom of the barrel is closed. Arrows are inserted above the water to show the direction of the piston. In order that these arrows may not distract the eye from the main action they are made to coincide, with the exception that the head changes from end to end.

The drawings when completed are inked in heavy black outline, preferably with India ink. Slides are then made of these in the ordinary way; that is to say, a negative is made of each drawing and from this the slides are printed. Care must be taken, however, to preserve the true proportions so that when they are projected on the screen the two images will accurately coincide.

Projection Methods

The projection of these slides requires less skill than would at first be imagined. A dissolving lantern is used for the purpose. This type is composed of two exactly similar lanterns mounted on a single base and susceptible of being turned, to a slight degree, in any direction. One slide is put in each lantern and both images are cast on the screen at the same time. By manipulating the lanterns the outlines are accurately superimposed.

To procure proper dissolving effect and produce apparent motion in the diagrams a specially designed slide rheostat is used. As this instrument, which is on the instructor's table, is operated one picture fades gradually into the other. Since each image contains the same outline, it remains permanently on the screen and the moving parts seem to merge from end to end with no apparent lack of continuity. So perfect is the optical illusion thus produced that the effect has all the vividness of a moving picture. It might seem at first sight that this claim is exaggerated, but when it is remembered that Diagrammatic Motion Slides have been pronounced satisfactory by motion picture corporations, naturally little in sympathy with the movement, credence can easily be given to the fact. The

writer has often satisfied the scepticism of critics on this point by a short demonstration of the instrument.

The fact that the dissolving unit enables the instructor to operate the lanterns from his desk is a decided advantage, at least from a pedagogical standpoint. The lanterns are situated at the rear of the room and a three-wire cable makes connection with the dissolving unit. Before the lecture the slides are inserted in the lanterns and properly adjusted so that when the instructor wishes to use the slides in the course of his lesson, all he need do is turn the switch and the lanterns are ready for use. When he is finished he merely turns the switch again and goes on with his lesson. If still slides are to be used in the lesson it serves a similar use. When the first slide has been used, the change is brought about by dimming the first lantern and brightening the second. In other words by pulling the contact plate from one end to the other. In this way a certain amount of distraction on the part of the pupils, as well as a considerable inconvenience to the teacher, is eliminated.

To illustrate the advantage of these slides as an aid in the actual lesson let us suppose that it is the Castner process for the preparation of chlorine and sodium hydroxide that is being discussed. (The writer regrets that space will allow of only one example). It is very difficult for the students to understand the principle involved in this process unless they can see the mercury flowing from one compartment to the other. Now this action can be demonstrated very clearly by the use of motion slides. In fact, it was in an effort to overcome such difficulties that the writer conceived the idea which has become the subject of his invention.

Diagrammatic Slides Versus Motion Pictures

While the superiority of Diagrammatic Motion Slides over still slides is obvious, yet it may be asked, how do they compare with motion pictures. Although the writer wishes to claim for his slides only what is just, he believes that, as an aid in the teaching of physics and chemistry, they have advantages which give them the preference over motion picture films. In order that the principle proposed for the day's lesson be thoroughly understood, it is necessary that the students understand what each part in the diagram represents and the function it serves. For this purpose the image must remain for some time on the screen. On account of the inflammable nature of films such a thing is impossible. Again, the explanation must be repeated and the action demonstrated several times. It would be indeed very difficult for the editor of the film to determine beforehand just how many times the action should be repeated, because the amount of explanation required will vary with different classes. The fact that the slides occupy little space and are easy of access is also worthy of consideration. Another advantage is found in the fact that Diagrammatic Slides can be used in daylight without the inconvenience of darkening the room. This is due to the fact that they are made in heavy black outline which contrasts markedly with the white background. While the dissolving lantern can be operated from the instructor's desk, the motion picture projector requires constant care because of the danger involved.

Perhaps the greatest consideration, however, is that of cost. Anyone who has taught science for any length of time knows how hard it is to influence school boards to procure the bare essentials, let alone the accessories. The very fact that such aids are expensive is enough to convince the board that they are not necessary. To be of practical use to the teacher the equipment must be always at his finger tips. To say that the reels could be rented as required is an argument put forward only by one who has never taught the subject.

A few round figures will be of interest in this connection. It has been estimated that to produce, even in quantity, a part reel which would demonstrate the action of a diagram, such as has been described above, would cost between fifty and seventy-five dollars. The actual cost of a set of Diagrammatic Motion Slides showing the same result is one dollar and thirty cents. Furthermore the cost of a moving picture projector ranges from three hundred dollars upward, while the dissolving lantern fitted with special adjusters and dissolving unit is listed at one hundred and sixty dollars. These figures speak for themselves.

As Diagrammatic Slides have been used in practical service for three years, it may be justly assumed that they are no longer in the experimental stage. Several appreciative letters received from high schools and collegiates in which the slides are being used, bear ample testimony to this assertion. Although they have been thoroughly protected by copyrights, etc. in the interests of the firm which has sponsored their publication, the writer's chief aim has always been to give to the teaching profession something which has proven of great benefit to himself.

GOVERNMENT POSITIONS VACANT

Chemist-Pharmacologist—5922. A chemist-pharmacologist is wanted for the Division of Medical Research, Department of Health, Ottawa, at an initial salary of $3,480 per annum, which will be increased for efficient service at rate of $180 per annum until a maximum of $4,020 per annum has been reached. Duties —To perform biological and chemical assays of pharmaceutical and pharmacopoeial preparations and of refined and crude drugs, and to standardize these when required; correctly report upon work carried out; prepare for publication reports relating to the foregoing and also to problems of medical research; and to perform other related work as required. Qualifications—graduation in science or medicine from a recognized university with specialization in pharmacological work or equivalent post graduate teaching experience; ability to carry on independent research work along pharmacological-chemical lines; ability to read French and German.

Application forms properly filled in must be filed in the office of the Civil Service Commission, Ottawa, not later than September 27th. Forms may be obtained from offices of the Employment Service of Canada or from the Secretary of the Civil Service Commission.

PERSONAL

Mr. Richard Sneddon, F.C.I.C., is leaving the service of the Dominion Flour Mills, Limited, Montreal, where he has been employed as chief chemist for the past two years, to go to California for his health. Mr. John Miller, formerly chemist for the Shelley Bakeries at Vancouver is taking over Mr. Sneddon's duties as chemist.

Mr. R. M. Davy, who, for the past thirteen years, has been associated with the Dominion Bridge Co., Montreal, having been secretary for a number of years, has been appointed president and general manager of the Ames-Holden-McCready, Ltd., also of Montreal.

IRON AND THE LOWER OXIDES OF IRON—A CORRECTION TO BE NOTED

A typographical error occurred in the article on "Iron and the Lower Oxides of Iron" in our July, 1923 issue. On page 175, first column, in table I last line of table, under initial iron content the figures should be 98.88 instead of 99.88. Second column, first line, the word "over" should be omitted.

China Clay in the Malay States

The installation of machinery to work a deposit of china clay in the south of the unfederated Malay State of Johore is approaching completion, and it is said that favorable reports on this mineral have been received from Bombay, to which port the first shipment is to be made.

Maritime Chemists' Association Joins Canadian Institute

Report of Annual Meetings at Wolfville, N.S.

THE Sixth Annual Meeting of the Maritime Chemists' Association and First Meeting of the Maritime Branch of the Canadian Institute of Chemistry was held in the Annapolis Valley, Nova Scotia, August 23rd and 24th. The previous meetings of the Asosciation have been held in the chief manufacturing centres in the Maritime Provinces. This meeting was held in the chief apple-growing region, and was appropriately devoted to the study of the applications of chemistry to orcharding and apple-growing.

The Trip Through the Valley

The party assembled at Annapolis Royal at noon, August 23rd. After having lunch together, the members inspected the Dominion Entomological Station in that town, and then proceeded by auto easterly through the Valley, inspecting at several points orchards which had been treated with insecticide and fungicide dusts and sprays of various formulae. At Aylesford, a visit was paid to the canning, cider and vinegar plant operated by the United Fruit Companies of Nova Scotia. The party reached Waterville early in the evening, had supper at Parker's Hotel, famous for its table, and later proceeded to Wolfville to spend the night.

The next morning was spent at the Dominion Experimental Farm at Kentville, looking over fertilizer experiments of several types, and treatments for various plant diseases. After dinner a visit was paid to the insecticide and fungicide dust-mixing plants of the United Fruit Companies. This was followed by a trip through the Gaspereaux Valley, visiting en route the Gaspereaux Power Plant and ground wood pulp mill, and arriving at Wolfville early in the afternoon. During the trip the members of the convention were much indebted to Prof. W. S. Blair, superintendent of the Kentville Experimental Station and to Dr. W. H. Brittain, Provincial Entomologist, for conducting the party and explaining the experiments at many of the places visited.

No account of the trip could be complete without reference to the clear bracing weather, and the stimulating effect of the scenery of the Valley, gloriously varied, but with unity given to the whole by the steep south escarpment of the North Mountain always in sight of the party from Digby Neck on the west easterly to its abrupt termination in massive Blomidon, which juts out into Minas Basin opposite Wolfville.

The Business Meetings

The business meeting of the Maritime Chemists' Association was opened at three o'clock in the Carnegie Science Hall of Acadia University, President C. C. Forward in the chair. The visiting chemists were welcomed by Dr. F. W. Patterson, President of Acadia, who in a brief speech showed a keen appreciation of the public importance of their work, and extended to them the freedom of the University.

The important items of business were as follows:

The Treasurer's report showed a balance from August 29th, 1922, of $21.35, dues collected since that time amounting to $33.00, bank interest of $1.10, making the total receipts $55.45, and expenses of $12.80, leaving in the treasury a balance of $42.65.

In accordance with the resolution passed by the 1922 meeting of the Association, the secretary moved the following resolution, notice of which had been sent to all members along with the preliminary announcement of the present meeting:

"Resolved that, inasmuch as, since the establishment of the Maritime Chemists' Association, the Canadian Institute of Chemistry has been founded and has been incorporated by letters patent, and whereas a Maritime Provinces Branch of the Canadian Institute of Chemistry has been established and is now fulfilling most of the purposes for which the Maritime Chemists' Association was established, be it resolved that the Maritime Chemists' Association dissolve itself and hand over its record books, correspondence, moneys and other property to the Maritime Provinces Branch of the Canadian Institute of Chemistry to become the property of this Branch." The resolution was seconded by Mr. K. L. Dawson. In response to questions, the secretary stated what he believed to be the mind of the late Dr. Eben Mackay, the founder of the Association, with respect to its future relation to a larger organization, and reviewed the gradual progress of events which had led up

GROUP OF CHEMISTS IN ATTENDANCE AT MEETING OF MARITIME CHEMISTS, AUGUST 23-24, 1923.

Left to right, back row: Prof. L. C. Harlow, Truro, N.S.; Dr. F. W. Patterson, President Acadia University; C. C. Forward, Chairman, Maritime Branch, C.I.C.; F. E. Wheelock, Provost of Acadia University; K. L. Dawson, Halifax (seated). Front row: A. Kelsall, Chairman-elect (seated), Maritime Branch, C.I.C.; F. E. Dickie, Shawinigan, Quebec; Prof. D. U. Hill, Wolfville, N.S.; G. C. Lordly, St. John, N.B.; F. A. Herman, Ottawa; Dr. A. C. Neish, President, C.I.C.; Prof. H. E. Bigelow, Sackville, N.B. (seated).

to the formation of a branch of the institute at the last meeting. Prof. Arthur C. Neish, president of the Canadian Institute of Chemistry, spoke of the ideals and probable future of the Institute, calling attention to the potentialities suggested by the history of the American Chemical Society. All of the members present seemed to feel that the substitution of the Branch of the Institute for the independent Association was in line with the policy of the Association from its beginning and that the Institute could be trusted to refrain from making by-laws which would interfere with local autonomy. The resolution was passed unanimously.

MEETING OF THE MARITIME BRANCH OF THE CANADIAN INSTITUTE OF CHEMISTRY

The meeting was immediately opened as the first regular meeting of the Maritime Branch of the Canadian Institute of Chemistry by Mr. Forward, the chairman of the Branch.

The following officers were elected: Chairman, Arthur Kelsall, Annapolis Royal, N.S.; Secretary-Treasurer, Prof. D. U. Hill, Wolfville, N.S.; Executive, Prof. H. E. Bigelow Sackville, N.B.; G. C. Lordly, St. John, N.B.; Dr. John S. Bates, Past President C.I.C., Bathurst, N.B.; C. E. Wallin, member of council, Sydney, N.S.; C. C. Forward, past chairman, Halifax, N.S. Messrs. Bigelow, Wallin and Hill were appointed a committee on by-laws. This concluded the business of the meeting.

PAPERS

Prof. L. C. Harlow then read a paper on "Crude Gas Liquor as a Nitrogeneous Fertilizer." The paper embodied the results of many experiments which had been made as a consequence of the getting together of Prof. Harlow and Mr. Dawson of the Nova Scotia Tramways Company at the meeting of the Association two years ago.

The meeting then adjourned to 7 p.m.

At the evening session Dr. H. B. Vickery read a paper on "Vitamins," illustrated by lantern, which was heard with appreciation by many of the citizens of the town, as well as by the members of the branch.

The second paper was on "Sulphur and the Regulation of Soil Reaction," by W. A. DeLong of the Truro Agricultural College, read by K. L. Dawson in the absence of Mr. DeLong.

Mr. F. A. Herman of Ottawa gave "An outline of the work relating to insecticides and fungicides contemplated and in progress by the Division of Chemistry." Mr. Herman's paper will appear in CANADIAN CHEMISTRY AND METALLURGY.

This concluded the program.

The chemists present at the convention were: C. C. Forward, Food and Drugs Laboratory, Halifax, N.S.; A. Kelsall, Entomological Station, Annapolis Royal, N.S.; G. C. Lordly, Atlantic Sugar Refineries, St. John, N.B.; L. C. Harlow, Truro Agricultural College, Truro, N.S.; H. B. Vickery, Connecticut State Experimental Station, New Haven, Conn.; K. L. Dawson, N. S. Tramways Company, Halifax, N.S.; H. E. Bigelow, Mount Allison University, Sackville, N.S.; Adam Cameron, University of New Brunswick, Fredericton, N.B.; F. E. Dickie, Northern Aluminum Company, Shawinigan Falls, Que.; Prof. D. U. Hill, Acadia University, Wolfville, N.S.; J. L. Bowlby, Yale University, New Haven, Conn., and to the great gratification of the Maritime members, President A. C. Neish of the Canadian Institute of Chemistry and Mr. F. A. Herman representing the Division of Chemistry, Ottawa.

THE LATE ALLAN CRAWFORD

Allan R. Crawford, commander of the expedition to Wrangel Island, is reported dead with other members of the expedition. He was a son of Professor T. H. Crawford of the University of Toronto Schools and a third year student in Arts, Chemistry and Mineralogy Course. Chemistry has lost a brilliant scholarship man, but Canada and the Empire has gained an Empire builder of the first order of merit.

Ontario and Quebec in Review Before Mining Interests

IT was a stroke of good fortune indeed when the American Institute of Mining and Metallurgical Engineers decided to hold their annual meeting this year in Montreal, and spend two weeks in Ontario and Quebec from August 20th to 31st. American mining interests were particularly focused on Canada. American mining and technical papers detailed on Canadian opportunities and American Engineers studied at first hand what had been accomplished and what might reasonably be expected.

The visit was indeed most opportune as capital is very favorably disposed to investment in gold mining in particular at this time. All summer we have had with us outstanding engineers representing London companies and with the close of this visit the situation has been very thoroughly surveyed by all large investing interests. Already results are showing. Broadly speaking, our visitors have been most favorably impressed with many possibilities in Canada.

A feature of the recent visit of American Engineers was the attention given their presence by provincial mining officials and geologists. Full reports and maps were readily available and officials from ministers down, were on hand to see that each visitor received all information available on anything he was interested in. In addition, operating companies gave full access to mills and underground operations. During the trip addresses were delivered on local geology, mining laws and regulations. Government officers did everything in their power to make clear the fact that as far as governments can go, everything possible would be done to assist and treat fairly those who undertook investment in the operation of mines in Canada.

On Monday, August 20th the party gathered at Toronto and were officially received by the Government at the Parliament Buildings by Hon. Chas. McCrea, Minister of Mines, and Hon. W. F. Nickle, Attorney-General.

THE NICKEL MINES AND SMELTERS

Starting in with Sudbury a day was spent visiting smelters of the Mond Nickel Company, British America Nickel Company and the International Nickel Company. The party spent some time underground at the International. These smelting plants produce now about ninety per cent. of our total nickel supply and are all in operation after a period of depression in the nickel industry. In fact, production has been increased considerably within the last few months. No effort will be made in this report to detail standard operations, but occasionally something more recently developed may be mentioned. Many visitors were interested in the sintering operations carried on at the Mond plant. Here fine ore is carried under the flame of an oil burner and the gases from the burning of the charge ore drawn off at the bottom of charge as it passes along. In this way a series of trays is adapted so that the whole operation is continuous and not very costly. The trays are about four feet wide, and the conveying table thirty feet long, while the flame from the burner plays upon a width of not more than a foot. Loading and unloading is practically automatic.

After a very pleasant reception at the Copper Cliff Club, The Hon. Chas. McCrea outlined the policy of the Ontario Government in respect to mining. Taxation on profits only with $10,000 exemptions, fair general laws and regulations regarding staking and developing properties, transportation facilities when developments show these are required and sustained publicity of the right type with mining interests in various countries and those who guide these investments.

The next two days were spent in the Cobalt and South Lorrain districts and on Lake Temiskaming. A good opportunity was presented to study the geological formations and mill operations.

Flotation put Cobalt back on the map and more recently the development of mines in South Lorrain has shown that very rich deposits may be expected over a much larger area than was at first thought possible. With silver in good quantity from South Lorrain to Gowganda it would appear that the whole valley of the Montreal river to within these areas at least offers a hopeful field for further development work.

During the first day the party spent a couple of hours in the refining room of the Nipissing Mine. Here had been collected one of the most remarkable exhibits of silver ore ever put in one place. Massive sample gave some indication of the really giant ore samples that the camp had produced. Leaf silver, and vein systems from which rock had been carefully detached gave some idea of the rich nature of the deposits. Silver in every form and combination found in the district was on view and needless to say presented a mute but powerful impression even on an audience containing many who for nearly twenty years have been familiar with the richness of these silver deposits. For those looking for something new, the rubber-lined ball mill of the Nipissing Company may be of interest. It wears well, is efficient and looks like a most recent practical idea.

At South Lorrain the hope for permanence in silver production was examined. Some wonderful deposits in place were examined. These properties have vindicated, among other things, the place of concentrated geological studies. Cobalt itself is in the midst of exploration work at a depth which gives much promise. When sound geological principles and massed capital unite, gold and silver discoveries seem to be much less than a gamble. Mining in Northern Ontario and Quebec owes most of all to Cobalt, and this one discovery may yet result in the bringing in many old districts as well as the discovery of many new ones.

While a portion of the party motored out to the South Lorrain district, the remainder spent the day on Lake Timiskaming. During the afternoon the parties were re-united and visited the very old settlement of Ville Marie.

The Gold Producers

This completed the survey of silver production and the following day was spent in the Kirkland Lake district. Here on a line of about two miles several producing mines are located. The camp is really just beginning to grow. The geology of the district was covered by Mr. Percy Hopkins and this along with productions to date indicates a very bright future. There are indications that ore will be found at considerable depth and operations in the surrounding district are very lively. The party was entertained to lunch at various mines and spent the afternoon either underground or in mill inspection. Considerable interest was shown in the mill design. Some tendencies are worthy of note. In one mill with a capacity of 250 tons per day, two men only were sufficient to keep everything moving. The mechanical operations were very distinctly separated from the chemical and not a foot of excess belting or pipe was in evidence. Platforms were so constructed that nearly everything was visible from many different points. With a few variations depending on the richness and hardness or composition of the ore, it seems not unlikely that a very high degree of uniformity in equipment and design will appear in new mills. The ideal mill for Ontario Gold may not have been built just yet, but it can be almost designed any time now. This camp will be a much larger producer and may even become a rival of Porcupine.

As a rest from mining and geology, the party stopped off at Iroquois Falls to inspect the 500-ton per day plant of the Abitibi Pulp and Paper Company. This was inspected quite as thoroughly as any mine, and the plant is a worthy example of what our paper industry is doing. Everything from the barking drums to the electric roll loaders hurrying the paper into cars for shipment was examined.

Perhaps it is not too much to say that most of the party anticipated their visit to the Porcupine field more than to any other single point. Here of course large scale operations are tangible evidence that gold mining is one of our best sources of national wealth. Practically two days were spent in going over the more highly developed properties.

The progress that is being made is beyond description in brief space. Each property has to some degree its own peculiar problems underground. There is much pioneer work being done along these lines and it is once again a question of geology and a more complete understanding of how, why and where valuable depositions occur. In milling, the stamp seems to be going out in favor of ball mills and rod mills.

Oliver Filters at the Hollinger Mine are reducing the already small percentage of gold unrecovered and the present output of 4,250 tons daily is keeping the force of 2,300 men speeded up. One rod mill is now operating and the program calls for a new one every three months. Their capacity is 700 tons daily per mill with the new power being developed on the Abitibi River the ultimate capacity of the plant now under development will be around 7,000 or 8,000 tons daily. In line with this operation, ore development is being pushed below the 1,700 foot level and a new central crushing station with five rolls as well as crushers will soon be ready.

Here is indeed well founded optimism and it is certain that the production of such wealth in one spot will stimulate those who believe that most mines are made, not discovered, to greater plans for development. Reports from mines throughout the districts are quite encouraging, and it is not unlikely that each year will see new producers in this camp.

Across Northern Ontario and Quebec

From Porcupine the special train took the northern route to Quebec City using the National Transcontinental Line which has opened up a large portion of Northern Ontario and Quebec. Quebec is very much alive to the possibilities of extending the producing properties into that province and some conception of the vastness of prospecting was secured by spending a whole day and night crossing practically unexplored, but favorable formations. At Quebec City two days were spent visiting points of interest.

The return to Montreal was made by way of Thedford and the asbestos industry studied. Here again in a very small area is visible a national asset which for many years has been a show place indeed. In complexity the process of mining and recovery did not compare with what had been viewed before, but in size of operation and in amount of rock handled, the development makes a remarkable study. It has been rather a pity that surrounding such wealth of specialized raw material, it has not been possible so far to build up extensive industries using the asbestos. To a degree this condition is being altered and the fabrication of asbestos products in a large way in Canada is something that will come.

It was a thoroughly enthusiastic party of mining men that President E. P. Mathewson led into Montreal for the official annual meeting.

Some Papers of the Montreal Meeting

"A Contribution to the Kick versus Rittinger Dispute," by H. E. T. Haultain, Toronto, Ont., in which the author describes experiments carried out with miniature rolls and an accurate integrating dynamometer from which he arrived at the conclusion that Neither Kick nor Rittinger accurately connect up size of product with energy required to crush rock. The ratio of size of product to energy will vary with the rock and with degree of crushing—

"Cherts and Igneous Rocks of the Santa Elena Oil Field, Ecuador," by Joseph H. Sinclair and Charles P. Berkey, New York, N.Y., who describe cherts and igneous rocks of Cretaceous

age in a region of very complex geological structure where petroleum has been obtained from surface pits for many years and recently from wells about 2,500 feet deep. The pits are in cherts near igneous rocks that, originally, were diabase sills in the predecessors of the cherts.

In "Mining Methods at Bawdwin Mine," A. B. Calhoun of Bawdwin, Upper Burma, gives a brief description of the mine, its history and early workings, and then describes at length the present working methods, the influence on them of the earlier mining, the estimated ore reserves, and the costs and production obtained.

Alexander L. Field, of New York, in a paper on "Some Effects of Zirconium in Steel," describes methods of experimental steel manufacture and laboratory testing, and discusses the preferential chemical re-action of zirconium with oxygen, nitrogen, and sulphur in steel in the light of typical analyses. He shows that:—

1. Zirconium combines chemically with oxygen, nitrogen, and sulphur in the order given, and is able to neutralize the embrittling effect of phosphorus in whole or in part.

2. A relatively small addition of zirconium makes possible the satisfactory rolling of steel containing as high as approximately .030 per cent. sulphur, which without zirconium treatment break to pieces on the first pass through the roll.

3. Plain carbon steels treated with approximately 0.15 per cent. zirconium exhibit in the heat-treated condition tensile properties that closely approach those of alloy steels, especially in that range of drawing temperatures between 300 and 450° C.

4. Zirconium reduces the total oxygen content of steel and operates to prevent the occurrence of emulsified slag and "banded" structure.

5. Zirconium combines with the nitrogen dissolved in molten steel to form a crystalline microsonstituent of a bright lemon-yellow color, which is, in large part, removed from the steel while the latter is still molten.

6. Zirconium forms, with the sulphur-content of steel, an acid-insoluble sulphide and eliminates from high-sulphur steels the last traces of iron sulphide.

NEW MEMBERS, CANADIAN INSTITUTE OF CHEMISTRY ELECTED AS FELLOWS:
F.C.I.C.

Arthur Kelsall, Dominion Entomological Laboratory, Annapolis Royal, N.S.

A COURSE IN INDUSTRIAL METALLOGRAPHY

Under the auspices of the Department of Metallurgy at McGill University an extension course in Metallography will be given as in previous years, by Messrs. Harold J. Roast, F.C.S.,F.C.I.C., and Charles Pascoe, F.C.I.C.

The course consists of fifteen periods, held on Monday nights at the Chemistry and Mining Building, McGill University, commencing on Monday, November 5th at 8.00 p.m.

Application should be made to Dr. Alfred Stansfield, department of Metallurgy, McGill University.

The fee for the course is $20.00 payable to the Bursar.

Inasmuch as only twelve members can be accommodated at one time, students will be enrolled in order of their applications.

In past years the class has been composed of mechanics, engineers, chemists and those desiring a winter hobby, or whose business brings them in contact with metals and who desire to have more knowledge of their composition. No previous knowledge is assumed and the course is essentially practical from first to last.

If any students from a previous year desire to continue their work, provision will be made for an advanced course if sufficient members are obtained.

Ferrous and non-ferrous metals are dealt with equally, training being given in preparing them for examination under the microscope and finally photographing the various structures developed.

World Wide Chemical News

(Special Correspondence to Canadian Chemistry and Metallurgy from Our London Representative)

British Chemical Industry

The Board of Trade returns for the month of June show that the imports of chemicals into the United Kingdom (the figures from April 1st last exclude the trade of the Irish Free State) during the month reached a total value of £933,234, as against the total of £878,489 for the larger kingdom in June, 1922. Imports during the first six months of 1923 amounted to £6,863,-136, as against £5,354,136 for the larger kingdom during the first half of 1922. The increase in trade, though small in value, appears from careful examination of the returns to have been a good deal more in volume, though clearly nothing in the nature of a boom is in progress. Among the lines in which Canada is more particularly interested may be mentioned acetic acid, imports of which during the six months reached 4,027 tons worth £170,684, as against the corresponding 1922 totals of 1,914 tons and £60,269 respectively. Imports of calcium carbide reached 313,707 cwts, worth £214,028, as compared with the corresponding totals last year of 225,118 cwts and £165,041 respectively.

Exports of chemicals during the month of June reached £2,385,072, as compared with £1,785,111 in June, 1922, and the six months' totals were respectively £13,120,508 for 1923 and £10,415,558 for 1922, the increase in volume being again greater than would appear from the values recorded. Exports of coal tar dyes during the half-year reached 41,948 cwts, worth £381,-947 as against the corresponding 1922 totals of 23,429 cwts. and £314,717 respectively; and other dyes exported amounted to 32,825 cwts, worth £52,003, as against the 1922 totals of 23,807 cwts, and £47,729.

The month of July has been the quietest as regards business for some considerable time. Neither buyers nor sellers have any confidence in the future and will not commit themselves to forward contracts. The domestic demand for heavy chemicals is much below normal by reason of the continued slackness of the textile industry, and the reduced activity of the iron and steel manufacturers. The export trade is, of course, hindered by the situation on the European Continent. The Ruhr occupation is believed by some to have benefitted British manufacturers by removing an awkward competitor. Any such apparent advantage is, however, merely superficial, as it is heavily discounted by the removal of customers and the disturbance of overseas markets everywhere. The great need of British industry throughout is the re-settlement of Europe, and without it there can be no return to prosperity. Export figures, while encouraging, are mainly a reflection of orders placed months before, and are no criterion of current business. It is feared that the trade returns will show a decline for the next few months.

There is very little of interest to record in regard to price movements, which seem to have become stabilized, particularly so far as heavy chemicals are concerned. Prices of pharmaceutical chemicals show a downward tendency with very little business passing.

British Empire Exhibition

All the space in the Chemical Section of the British Empire Exhibition, amounting to 30,000 square feet, has now been allocated and the architectural arrangements are well in hand. A special sub-section, which is probably unique, is being organized by a Committee under the chairmanship of Dr. Levenstein, to demonstrate the recent progress in the industry on the purely scientific side. Remarkable as the industrial exhibits will be, this scientific section will impress upon visitors the fact that the industry is being built on a strong foundation of scientific knowledge which is being constantly developed by research work.

Seventh Annual Meeting of the Association of British Chemical Manufacturers

At the meeting of the Association of British Chemical Manufacturers in July an excellent report was presented of work done and progress made, and the gathering afforded still further evidence of the spirit of co-operation which has developed among British manufacturers since the war. Both Sir Max Muspratt and Sir William Alexander emphasized the closer linking up of the older heavy chemical industry with the younger dyestuffs industry. Sir William has recently pointed out that the average price of dyestuffs has been reduced from 3s. 5d per pound in 1921 to 2s. 6d in 1922. It must be remembered that many countries have now established dye industries of their own and this fact, coupled with trade depression, has restricted British exports to a large extent. The output of the British dye works is, therefore, much below their capacity and plants are not being run so economically as they could be, were the markets as broad as they were for the German manufacturers in pre-war times.

British Cyanides Company to Manufacture Fixed Nitrogen

An important decision has just been made by a company well-known in the Canadian chemical and mining industries, and at the annual general meeting of the British Cyanides Company, Limited, held recently, Mr. Kenneth M. Chance intimated that the Company had achieved gratifying success in their efforts to produce nitrogen by atmospheric fixation. The plant suggested was not a costly one, nor would it take long to erect, and he hoped that within a few months' time they would be supplying the markets of the world with a part of its requirements of those cyanogen products for which the reputation of the company was established, manufactured from atmospheric nitrogen. Furthermore, they had two plants in course of erection, each of which was a practical working unit, with a view to fixing atmospheric nitrogen at a sufficiently low cost to convert it into ammonia at a price which would enable them to compete with any other method of manufacturing this product.

They had now overcome the last of the difficulties in respect of the manufacture of permanganate of potash by electrolysis, and new plant for the manufacture of that chemical was in course of erection at the Tat Bank works.

Synthetic Ammonia Production in France

The Commission of Finance of the French Senate has recently had before it the Bill (passed by the Chamber of Deputies) for the manufacture of synthetic ammonia. Although agreeing with the Chamber as to the necessity for carrying out the agreement entered into with the Badische Anilin-und-Soda Fabrik for the manufacture of ammonia by the Hager process, the Commission considers that the form of working the process, as passed by the Chamber, requires considerable revision.

May Manufacture Synthetic Nitrates

The Commission of Agriculture of the French Chamber has before it a report by Monsieur Duchein containing proposals for the manufacture in France of synthetic nitrates, of which only about 70,000 tons are consumed annually in France as against Germany's total of 500,000 tons.

French Alcohol Production

The effort of the French Government to make the country independent of other nations for its supply of alcohol has resulted in the accumulation of more than a million hectolitres (about 26,400,000 American gallons). The alcohol is made from sugar beets, and the Government is obliged by law to buy all the alcohol which is offered. Every importer of gasoline must mix with it ten per cent. of industrial alcohol to reduce the surplus on hand, and it is possible that the admixture of alcohol will be increased from ten to fifty per cent. if it is found to work with satisfaction.

Mining and Metallurgy in British Columbia

(Special Correspondence to Canadian Chemistry and Metallurgy.)

Federal M. & S. Secures Controlling Interest In Duthie Mine

The most important mining transaction of the month is the purchase of a controlling interest in Duthie Mines by the Federal Mining & Smelting Company, a subsidiary of the American Smelting & Refining Company. J. F. Duthie became interested in this district in 1919, when he bonded the Mamie group of claims on Hudson Bay Mountain, about thirteen miles to the east of Smithers, on the Grand Trunk Pacific Railway: since then he added group after group to his holdings, until now he has a large consolidation. His principal exploration work has been on the Mamie and Henderson groups. On the Mamie he has opened up a vein, averaging about eight feet in width, by open cuts, shallow shafts and tunnels, and he started a 900 foot tunnel, to develop the vein at a depth of 500 feet. A thorough sampling of the various openings demonstrate that the vein contains a good grade of milling ore, the predominating value being gold, which is associated with arsenopyrite, zinc-blende, chalcopyrite, and a little galena. More extensive work has been done on the Henderson group, where a four-foot vein has been opened up by a series of open cuts and tunnels. The vein contains stringers and lenses of high-grade silver ore, while after the high-grade has been picked out the remainder is good milling ore. In the early part of the year, 223 tons of high-grade was shipped to the Trail smelter. H. A. Guess, mining engineer for and vice-president of the American Smelting & Refining Company, and Dale L. Pitt, manager of the Premier mine, made the examination of the properties and recommended the purchase. Mr. Guess announced that an aggressive campaign of development would be commenced at once, and that the high-grade would be shipped by way of Prince Rupert to the Selby smelter, on San Francisco Bay. Mr. Duthie, who retains a substantial interest in the property, is to be congratulated on the outcome of his pluck. He entered a comparatively untried district, and spent about a quarter of a million dollars on exploration, equipment, and purchase of properties.

Fire At Anyox Smelter

On July 14, a serious brush fire started near the coke-ovens of the Granby Co. at Anyox, and, fanned by a brisk breeze, was soon hopelessly beyond control. The fire raged through the night, and, but for a timely downpour after the explosion of the dynamite magazine, the whole town would have been destroyed. The trestlework, carrying the railway from the mines to the smelter was destroyed, and the smelter had to be closed for a week while repairs were being effected. There was 90 tons of dynamite in the magazine, but, fortunately, most of it burned, only a few tons exploding.

There has been a persistent rumor that the Granby company did not intend to start up the Copper Mountain property at present. This has been flatly denied by J. T. Crabbs, the president, and H. S. Munroe, the general manager, who explain that the delay in starting operations has been caused by the delay in repairing the twelve-mile spur from Princeton to the property. This has been corroborated by D. C. Coleman, vice-president of the Canadian Pacific Railway Company, who stated that the delay in repairing the spur was due to the difficulty in obtaining labor.

Indian Mines Re-organized

At a general meeting, held at Prince Rupert, the shareholders of Indian Mines, Limited, decided to re-organize the company, change its name to Indian Mines Corporation, Limited, and increase the capital from $1,600,000 to $3,000,000. It is stated that arrangements practically have been completed for the underwriting of the new capital in London and for the listing of the shares on the London exchange. The company owns four

crown-granted claims about a mile to the northwest of the Premier mine and holds options on six other claims. Part of the new capital is required to exercise these options, the value of the claims having been demonstrated. A large amount of surface work has been done in exploring a vein, ranging from ten to eighteen feet in width, for a distance of more than 1,000 feet. Three tunnels have been driven on the vein, one for some 300 feet in milling ore, and another for close to 500 feet. A third tunnel has been started. High-grade silver-lead ore has been found in one of the open cuts and in the No. 2 tunnel. A considerable body of milling ore has been developed, and this is leavened in spots by high-grade. Most of the stock of the old company was held in Montreal and Toronto.

Montreal and Toronto intesrets have bonded the Hercules group, which adjoins the Big Missouri, at the head of Salmon River valley. Some promising ore was found on the surface by a company, under the supervision of the late R. G. E. Leckie, but an attempt to develop it at depth by a tunnel resulted in failure.

INTERESTING PLANS FOR CHEMICAL EXPOSITION.

Plans for the coming National Exposition of Chemical Industries, New York, September 17th to 22nd., are shaping rapidly. A preliminary announcement concerning the speakers for the Students' Courses at the Exposition has been made as well as the preliminary program of the motion pictures.

The Students' Course Program

Announcement was made to students in colleges throughout the country that courses in chemical engineering or industrial chemical practice are being given on the fundamentals of chemical engineering and industrial chemical practice at the Exposition. Students of chemistry and chemical engineering are invited to enroll in this short course given under the direction of a committee of educators. This committee being under the Chairmanship of Professor W. T. Read, of Yale University, a member of the Advisory Committee.

Lectures will be given by men prominent in various phases of the chemical engineering industries. They will be supplemented by group conferences and supervised inspection of the exhibits. A report or examination on certain phases of the course may be required by the committee.

The following topics will be included in the course:

1. Plant Equipment in the Chemical Engineering Industries.
   - (a) Disintegration—Crushing and Grinding.
   - (b) Mechanical Separation—Grading.
   - (c) Separation of Solids from Liquids—Thickening, Filtration, Centrifugal Separation.
   - (d) Separation with Phase Change—Evaporation, Distillation, Drying.
   - (e) Handling of Materials.
2. Materials of Construction:
   What material to use, when, where and why.
3. Chemicals in Commerce:
   The distribution of chemicals.

At this time the preliminary announcement of speakers for the above subjects is made as follows: Subject (a) and (b) will be generally discussed by Galen H. Clevenger, an engineer prominent in this work. Subject (d) will be discussed in general by Professor W. H. McAdams, of Massachusetts Institute of Technology, whose recent work and co-authorship of "Fundamentals of Chemical Engineering" created such stirring interest in technical circles. Subject (e) will be discussed by A. E. Marshall of Baltimore and other speakers upon the same subject will be Harry Carlson on "Conveying with Steel Belting", S. G. Ketterer on "Pumping by the use of the Jet Apparatus", and G. L. Montgomery, discussing "Transportation in the Chemical Industry."

Subject 2 will be broadly discussed by W. S. Calcott, chemical engineer of the Du Pont Company and other speakers will be Ross C. Purdy, secretary of the American Ceramic Society,—"Ceramic Materials: clay, glass, silica and enamelware" and O. I. Chormann, "Glass, Enamel, Steel Products as Materials of Construction", Homer Hendricks, "Zinc as a Material in Construction."

There will be no charge made to the students attending this course and already over 150 students have applied for admission to attend this students' course.

In view of this wide interest Columbia University has offered three of its dormitories to the students attending this course for use during the week of the Exposition, making a special rate to these students.

The Motion Picture Program

This program will be an elaborate and interesting program and already contains the following films; "The Story of Duriron as a Non-Corrodible Material for Chemical Apparatus" (1 reel) courtesy of the Duriron Company.

"Operations of a Nickel Rolling Mill Producing Sheet and Wire". (5 reels). Courtesy of International Nickle Company.

"The Story of Sulphur and how it is Secured". (2 reels). Courtesy of U.S. Bureau of Mines and Texas Gulf Sulphur Company.

"The Story of Asbestos and its Manufactures". 4(reels). Courtesy of the Johns-Manville Company and U.S. Bureau of Mines.

"Saving Coal in the Home". (1 reel). Courtesy of U.S. Bureau of Mines.

"The Diary of an Abrasive Stone" (4 reels). Courtesy of U.S. Bureau of Mines and Carborundum Company.

"Water Power". (2 reels). Courtesy of U.S. Bureau of Mines and Westinghouse Electric and Manufacturing Company.

"The History of Transportation". (2 reels). Courtesy of U.S. Bureau of Mines and Westinghouse Electric and Manufacturing Co.

"The Story of Motor Truck Transportation". (3 reels). Courtesy of U.S. Bureau of Mines.

"Story of Steel". (6 reels). Courtesy of U. S. Bureau of Mines.

"When Wages Stop: Showing Safety First in the Petroleum Industry." (4 reels). Courtesy of U.S. Bureau of Mines.

Society Meetings With Exposition.

The Chemical Exposition this year is being held during the week immediately following the annual meeting of the American Chemical Society, as has been the custom in previous years. The A.C.S. will meet during the week of September 10 at St. Paul, and immediately after the close of the meeting, its members will entrain for New York in order to spend the week of the 17th at the Exposition. The usual meeting of the American Ceramic Society will be held in conjunction with the Exposition in the Grand Central Palace on September 19th, probably extending over several days. The annual banquet and election of the Salesmen's Association of the American Chemical Industry will also be held during the week of the Exposition, very probably at one of the Pershing Square group of hotels near the Grand Central Palace. The regular Dinner during the Chemical Exposition of the American Institute of Chemical Engineers will be on Wednesday evening, September 19th at the Park Avenue Hotel, reservation for which should be sent to Dr. John C. Olsen, the Secretary, at 85 Livingston Street, Brooklyn, N.Y.

The Technical Association of the Pulp and Paper Industry will hold its fall meeting this year in connection with the 1923 Chemical Exposition during the week of September 17th to 22nd at the Grand Central Palace, New York. This has been the custom of the association during the past few years. Speakers at the meeting will be chiefly representatives from firms exhibiting at the Exposition, and the talks will be fifteen minute discussions on various types of apparatus, equipment and chemical products for the paper and pulp mills.

Industry and Trade

Industrial Developments---Trade and Company News---Financial Notes---Patents---Market Review and Prices

INDUSTRIAL DEVELOPMENTS

FORT WILLIAM, Ont.—The Great Lakes Pulp & Paper Co. will erect a $3,000,000 plant on a site on the Kaministiquia River near this city.

SASKATOON, Sask.—The University of Saskatchewan is constructing a building to be used in conjunction with the power house of the University, at an estimated cost of $50,000

SHAWINIGAN FALLS, P.Q—The plant of the Northern Aluminum Co. here is now operating to full capacity, manufacturing ingots and cable.

HALIFAX, N.S.—Ochre (raw sienna) of excellent color and quality has recently been discovered near Ellershouse Station on the Dominion Atlantic Railway.

TORONTO, Ont.—The University of Toronto has acquired a building here, where insulin will be manufactured on a commercial scale.

WINNIPEG, Man.—The Dominion Tar & Chemical Co. will construct a tar distilling and chemical manufacturing plant, at St. Boniface, at an estimated cost of $250,000.

MEDICINE HAT, Alta.—The Ogilvy Flour Milling Co. is now turning out 2,500 barrels of flour a day, when running full time.

PENETAGUISHENE, Ont.—The plant of the International Fibre Board Co. was destroyed on August 19th, with a loss of $500,000.

WOODSTOCK, Ont.—At a meeting of the creditors of the Peerless Cereal Mills, Ltd., which assigned recently, it was decided to reorganize the company. The liabilities of the Company are $215,000, and the assets $175,000.

SHAWINIGAN FALLS, P.Q.—Work on the extension of the plant of the Belgo Paper Co. is now almost sixty per cent. completed. The Belgo Company are making arrangements to place another paper machine in operation, which work will not be completed before the end of November.

SARNIA, Ont.—A branch plant is to be erected here by the Hachmeister-Lind Chemical Co. of Pittsburgh, for the manufacture of magnesite building materials, such as Stuk-Kote magnesite stucco, and Halicomp composition flooring.

HULL, P.Q.—The Mica Co. of Canada, Ltd. of this city, will handle their United States trade, in future, through a plant recently purchased at Massena, N.Y. This Company manufactures electric insulation, securing their raw material from the amber mica fields in the Kingston vicinity.

SARNIA, Ont.—A plant for the manufacture of carbon black from natural gas is to be erected here by the Sarnia Oil and Gas Co. This will be the first plant in the British Empire to manufacture this product from natural gas.

SUDBURY, Ont.—Approximately 1,000 tons of ore per day are being treated at the smelter of the British America Company here.

BATHURST, N.B.—The new ground wood mill of the Bathurst Co., Ltd. is now in operation, producing newsprint from the ground wood pulp. This marks a new stage in the development of this Company, which formerly manufactured only sulphite and sulphate pulp for export to American and European markets.

SHERBROOKE, P.Q.—The Brompton Pulp & Paper Co. has acquired a controlling interest in the Dominion Lime Company, whose plant at Lime Ridge, P.Q., has been operating for the last forty years.

ST. JOHN, N.B.—The Canadian Independent Oil Company which have two large oil tanks at Courtenay Bay are now erecting additional tanks, one large one with capacity of 167,000 gallons for fuel oil and four small ones each with a capacity of 40,000 gallons for gasoline and lubricating oils.

MONTREAL, Que.—Sir William Nicholls, governing director of Shillers Milling and Associated Industries, a $35,000,000 concern, has sailed from Southampton, England, for a tour of Canada. He will investigate the growing and handling of wheat, and will look into the flour milling industry in Western Canada, also the shipping facilities which exist for wheat and flour via Vancouver. If prospects prove favorable, it is declared his company will invest large sums of money in the flour milling industry of Western Canada.

VICTORIA, B.C.—The loganberry wine industry has been initiated in the Victoria district, and the Growers' Wine Company, Ltd. is already producing its product at Saanich. A great future is confidently expected for the industry with the extension of the province's acreage under loganberries.

COAL DISTILLATION PLANT TO BE ERECTED BY FORD MOTOR CO. AT FORD, ONTARIO

Considerable interest has been aroused by the announcement that the Ford Motor Company of Canada, Limited, were to erect a coal distillation plant at Ford, Ontario. According to official announcements from the company the plant, now under construction and to be finished within a few months, will have an initial capacity of 400 tons per day, but provision has been made throughout for a plant to handle 2,400 tons of coal daily. The products of the plant will be, first, coke, which will be burned to pulverized form under the power plant boilers; second, the surplus gas, of which about 4,000 cubic feet will be produced per ton of coal, which will be used in forging and heat treating operations required in the preparation of the steel for Ford motor cars; third, sulphate of ammonia, for use as a fertilizer; fourth, cresote, to be sold for timber preserving purposes; fifth, benzol, gasoline and kerosene; sixth, lubricating oils and greases, which will not be taken from the oils remaining after the recovery of gasoline, kerosene, and cresote, at this time, but which may be utilized later for burning as ordinary fuel oil. After treatment, the available amount of benzol or motor fuel resulting from high temperature distillation will reach a maximum of four and a half gallons per ton of coal treated, whereas in low temperature distillation such as will be used at Ford, this will be increased to twelve gallons per ton, and the resulting material from both a chemical and physical standpoint will be true gasoline, differing from gasoline obtained from petroleum only in its initial form, through the fact that it will contain a larger percentage of unsaturated hydrocarbons. A large percentage of these unsaturated hydrocarbons, however, will be synthetically converted at the new Ford plant into their true gasoline form.

It will be seen that the benzol production may reach 4,800 gallons daily, and the Ford Company intend to market it as a practical substitute for gasoline.

Facilities have been provided for the storage of 100,000 tons of coal on the river front. Canadian lignite and bituminous coal will be used. The process to be used differs from previous practice in that the coal is distilled at a comparatively low temperature, which makes possible the recovery of volatiles which have hitherto been lost because high temperature process ovens only have been used.

A similar plant on a somewhat larger scale is being erected at the River Rouge plant of the Ford Motor Co., Detroit, but the Canadian plant will be completed and in operation several months before the plant at River Rouge.

NORTHERN ONTARIO DEVELOPMENTS

The McIntyre-Porcupine is now realizing gross income equal to a rate of approximately one hundred per cent. annually on the company's issued capital of $3,600,000. The gold content of the year averages between $10 and $11 a ton and the margin of net profit is indicated to be between forty and fifty per cent. on the issued shares of $5 par value. Operations for the fiscal year ended June 30th, show a gross output of $2,249,742 conducted with a mill of 550 tons daily capacity, with the exception of the closing weeks of the year, when the plant was brought to a capacity of 1,000 tons.

The income of the Lake Shore Mines Co. for the six months ended June 30 amounted to close to $300,000 made up of production $288,074.50, plus exchange premium and interest. This was accomplished with a mill which treated an average of about sixty tons of ore daily. The average yield of gold per ton amounted to upward of $26. The mill is being enlarged with a view to handling about 300 tons of ore daily.

After a fruitless search accompanied by more mishaps than any mining venture could survive as a continuous performance throughout a period of almost twenty years, gold ore of exceptional richness has been found under the most favorable conditions on the property of the Lake Fortune Mining Co., located on the Boischatel-Basserat Townships line in Quebec. Combined geological and mineralogical features, (the gold being associated with tellurides, molybdenite, heavy sulphides and in a free state, in nuggets and disseminated), have left the impression, with those competent to judge, that the find is the most spectacular of recent years in point of lateral continuity.

The Northern Ontario Light & Power Co. is now doubling the power supply to Kirkland Lake through the building of an extra line to the gold camp, and the adding of whatever other equipment is necessary. A good start has already been made on the job. The present line, which will be paralleled in part by the new transmission line, is stated to be good for 5,000 horsepower.

The second furnace of the British American Smelter at Sudbury was blown in towards the middle of August and both furnaces are now in operation; but it will be a matter of possibly two months before production reaches the peak. The plant could easily employ 500 more men, but as these are not available, production is being considerably curtailed. A third furnace is on the ground but has not yet been erected. According to President Rose the nickel market is healthy enough, and its prospects warrant erection of the third furnace shortly; and it is quite possible that before six months have passed, three furnaces will be in operation. Approximately 1,000 tons of ore are being treated daily at present. With both furnaces operating at capacity it is expected that it will be increased to such an extent that the monthly amount of ore treated will be close on 50,000 tons.

It is understood that Premier Ferguson has in mind changes in the Ontario Mining Act which will promote the more vigorous performance of work on mining claims. The present requirement of 200 days' work in five years will probably be altered. It is hoped that old country capital will take a greater interest in developing Ontario's natural resources. Steps are being taken which should prevent the sudden forfeitures that recently caused considerable loss of confidence in Ontario mining titles.

A preliminary report of the McIntyre Porcupine Mines, Ltd., for the fiscal year ended June 30th 1923, shows net earnings before plant depreciation of $919,166.

IN THE PULP AND PAPER INDUSTRY

It is officially announced that the Dominion Lime Co., one of the largest shippers of lime in the Dominion, has passed into the hands of the Brompton Pulp and Paper Co. The paper company, one of the largest users of lump lime, is understood to have $50 a share for its controlling interest and an offer is being made to other shareholders on somewhat similar lines. It is understood that there will be no change made in the name or management of the company and A. F. Fraser, who has been connected with the company for the past ten or twelve years, as general manager and secretary-treasurer, will continue to act in this capacity.

The agreement between the city of Fort William and the Great Lakes Pulp and Paper Co. has been signed by both parties, thus ending negotiations which have been going on for many years, involving the controversey over the price of power in the city of Fort William from the Nipigon development of the Hydro-Electric Power Commission of Ontario. The company gets power at $18 per horsepower. The site selected is on the Kaministiquia river. Plans are already drafted and work on a plant to cost about $3,000,000 will commence at once.

Sir Federick Becker, head of Becker & Co., London, England, is on his annual tour to Canada where he comes to watch over his many interests in the pulp and paper industry. It is very interesting and hopeful that Sir Frederick is taking a deep interest in the subject of pulp from straw and intends investigating possibilities along this line in Canada. The De-Vains process is spoken of as the one which might possibly be used for production of high-grade straw pulp.

With respect to the perpetuation of pulpwood supplies, Sir Frederick said: "I am always worried to see the meagre forest protection forces squandering their energies on the doubtful German theories of reafforestation. Protection against fire and making the starting of a forest fire a criminal offence, condemned by law as well as by public opinion, seems to me to demand every cent that can be raised and every effort that can be made."

Canadian newsprint production for June was 108,832 tons, and for July it was 105,716. There is usually a decline in production in July, as the demand is not quite so great, and the mills take the opportunity to make repair and get ready for the fall business.

The personnel of the commission which will inquire into the forest resources of Canada with a view to determining the need or otherwise of an embarbo upon the exportation of pulpwood was announced by Premier King as follows: Joseph Picard, manufacturer, Quebec, chairman, A. B. Kerr, barrister, Toronto, R. W. McLelland, barrister, Fredericton, N.B., Joseph G. Sutherland, lumberman, Clyde River, N.S., and William Anstie, contractor, Vancouver. E. H. Finlayson, acting director of forestry in the Department of the Interior, is attached to the commission as secretary.

There were 104 pulp and paper mills in operation in Canada during 1922, and the total net value of the production of these mills was $155,785,388. The amount of capital invested increasedfrom $379,812,751 in 1921 to $381,006,324 in 1922.

POWER DEVELOPMENT

The contract for the construction work of the development of the power site of the Southern Canada Power Co. at Hemmings Falls, near Drummondville, on the St. Francis River, has been let to the Foundation Co. of Canada, and preliminary work will start at once. It is proposed to develop 30,000 horsepower. Over half of the capacity of the new plant has already been sold, and if the industrial department of the company is as successful in locating new industries in the territory served by this company as it has been in the last two or three years it is not an exaggerated hope that the total capacity of the new plant will be disposed of by the time the plant is in operation.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

ELECTROPLATING WITH ZINC—J. Haas, 233148, July 31, 1923. In Zn electroplating from a cyanid bath the Zn is deposited in the presence of Hg to produce a coating of Zn alloyed with Hg. The article to be plated may be dipped in Hg or a Hg compound before plating. The bath should contain a small amount of Hg or soluble Hg compound.

RECOVERING LIGHT METALS FROM SCRAP—A. Beielstein, 233132, July 31, 1923. Such metals as Mg. and Al are recovered from scrap by moistening the scrap with $MgCl_2$ corresponding approximately to the quantity of impurities present and sufficient to ensure the agglutinations of foreign bodies. The scrap is first melted then moistened with fused $MgCl_2$ to cause agglutination of the impurities, the mass is then stirred until all the $MgCl_2$ is taken up and allowed to settle when the metal melt is separated from the impurities.

DESULPHURIZING IRON AND STEEL—D. D. Jackson, and J. D. Sears, and F. Conlin, 233301, August 7, 1923. Fe steel, ferro-alloys and Cu are desulphurized by treating the molten metal with a mixture of alkaline metal silicate alk-metal hydroxide and, or, alk metal carbonate.

RECOVERY OF SULPHUROUS ACID AND HEAT FROM THE WASTE GASES FROM PULP BOILERS—H. Clemm and C. Hangleiter, 233159, July 31, 1923. The gases and vapors from pulp boilers are introduced without cooling into the raw lye in a closed tank under pressure.

ZINC ELECTROPLATED ARTICLES—J. Haas, 233149, July 31, 1923. Ferrous articles are coated with a dense bright electrolytic coating of Zn. alloyed with Hg.

METHOD OF GRANULATING LIME NITROGEN—S. E. Rodling and A. P. Zamore, 233344, August 7, 1923. Pulverulent $CaCN_2$ is treated in a container, through which it is conveyed with dilute HNO_3 and agitated to granulate and dry it. The container may be heated and the $CaCN_2$ may be also treated with an oil.

ELECTRIC FURNACES—W. E. Moore, 233338, August 7, 1923. An electric furnace of the tilting type has electrode adjusting means comprising a motor driven winch mounted within the transformer housing walls, a cable connected on the electrodes and the winch, means for normally causing the cable to exert a frictional grip on the winch drum and means for automatically releasing the grip when the electrode reaches the upper or lower limit of its movement.

TREATMENT OF COPPER ORES—W. G. Perkins, 233554, August 14, 1923. Ores containing CuS are crushed and roasted with access of air at 350-700° to convert the CuS to $CuSO_4$ with a corresponding swelling, the oxidized material is heated with a reducing gas to reduce the $CuSO_4$ without melting and without fritting the gangue so that the reduced material is obtained in a porous condition, and then leaching the product with an NH_3 solvent of Cu in the presence of O.

FOXBORO COMPANY APPOINTS REPRESENTATIVE

Mr. C. H. Roessner has been appointed district sales manager for The Foxboro Co., Inc., manufacturers of high-grade recording and indicating instruments, Foxboro, Mass. He will have his offices at 1510 Monadnack Bldg., Chicago, Ill. Mr. A. F. Mundy, formerly of their Chicago office will represent the company in southern California, with offices at Pacific Finance Bldg., Los Angeles, Cal.

BRITISH COLUMBIA DRUGGISTS ORGANIZE COMPANY

The retail druggists of British Columbia have organized a company to take over and operate the wholesale drug business of J. A. Tepoorten & Company, 308 Water Street, Vancouver, which was established some fifteen years ago. More than 150 out of the 200 druggists have subscribed to this new concern, and it is expected still more will take stock. E. J. Tepoorten, son of the founder of the business, will act as manager and buyer for the new company. The following have been elected directors of the new concern which will be known as the Tepoorten Drug Company: A. E. Marrett, Vancouver, chairman; George Cunningham and R. H. Duffy, Vancouver; Walter Bews, New Westminster; F. Williams, Victoria; W. J. McCutchen, Prince Rupert; J. Buckram, Golden, and A. Galloway, Kamloops.

BUFFALO FOUNDRY AND MACHINE COMPANY TAKES OVER THE CANNON-SWENSON COMPANY

The Buffalo Foundry and Machine Company, builders of the widely known line of Buflovak and Buflokast Vacuum Drying and Chemical Apparatus, has taken over the interests of the Cannon-Swenson Company of Chicago, who are well-known to the sugar industry, as consulting and contracting engineers.

Martin J. Kermer, formerly the chief engineer and general manager of the Cannon-Swenson Company is to remain in charge of the Chicago office with headquarters at 1636 Monadnock Block, as the accredited representative of the Buffalo Foundry and Machine Company, in the Chicago territory.

Mr. Kermer has had wide and valuable experience in the field of general and chemical engineering; and is regarded as an authority on sugar plant design and operation.

The policy of the Buffalo Foundry and Machine Company in taking over this company and maintaining a Chicago office, has been primarily to afford a closer co-operation with customers located in this territory, and to place at their disposal more ready engineering service.

The standard line of Buflovak Sugar Apparatus will be supplemented by some pieces of equipment formerly built by this company.

CATALOGS RECEIVED

"Dust Problems and Their Solution"—Midwest Air Filters, Inc., 100 East 45th St., New York. "Dust Engineering," is a comparatively new branch of applied science, having for its object the development of processes and apparatus for the elimination of dust. This problem has been "tackled" in a most scientific way by the Midwest Filters, Inc., with the result that in their midwest filter processes and apparatus they have developed means whereby they can satisfactorily take care of almost any situation where the elimination of dust is desired. Apparatus has been devised by this company for use in industrial plants, public buildings, stores, etc. It is well-known that the effect of dust on many classes of machinery and equipment is very deleterious. In processes for the manufacture of finely powdered products, such as pigments, lamp black, graphite, flour, cement, etc., large annual losses are caused through these products escaping with exhaust air or gases. Again, in glass grinding, steel grinding, sand blasting, buffing, large quantities of injurious and in some cases dangerous dust are created, highly detrimental to the workmen's health. It is to take care of such cases as these that the Midwest air and gas filters have been devised. The booklet describes clearly the various types of filters, their installation and action, illustrated by photos and diagrams. Three pages are devoted to letters received from users of Midwest filters. It is a very attractive booklet which any chemist or engineer would find of interest.

Chemical, Oil and Metal Markets

CHEMICALS.

The Summer dullness, that overspread the chemical market generally during July and August, has now entirely disappeared. Enquiries are more numerous, orders are steadily increasing, and a more optimistic tone is noted in the market. Present indications, barring any serious industrial sethacks, are for a healthy Fall husiness. Financial experts express kcen satisfaction that business is taking the upward swing in steady fashion, thus eliminating the prohahle chances for short-lived hooms, which hitherto have cursed hoth American and Canadian industry.

Quotations on industrial chemicals are remaining remarkahly steady, a good sign as to the stahility of the industry. The heavy acids and alkalis are in good demand, and the husiness in these lines during July and August was well ahove the average for Summer transactions. Caustic potash is scarce at present, with quotations holding firm at 11 to 12 cents in large drums. Demand is keeping up well in acetic acid, formaldehyde and wood alcohol. The same is true of caustic soda and soda ash. Flake and ground caustic are specially active at prices of from $5.00 to $5.50 per cwt. Arsenic is steady at 13½ to 15 cents per lh. There is little activity in copper sulphate.

A feature of the coal tar products during the last week of August was a reduction of 5c per lh. in phenol prices, due to the operations of recently-started factories manufacturing synthetic phenol. The intermediate market is showing improvement, and manufacturers look for a good increase in husiness this Fall.

METALS.

The metal market continues quite active. Lead and zinc are hoth in improved position, with advanced quotations. Zinc has advanced to ahove $8.00 per cwt. in car lots and is quoted at $8.10 per cwt., with small lots hringing around $8.60 per cwt. There are no large stocks of either lead or zinc anywhere at present, and there is every prospect of the demand keeping up well during the Fall months. There is a splendid demand for zinc from England and considerahle quantities are heing exported from this side.

Lead is again up to $7.00 per cwt. for car lots and small lots arc hringing $7.50 to $7.55 per cwt.

Copper continues dull, hut there is a somewhat hetter tone evidenced in the market since Sept. 1st. England and France have heen the chief huyers of late, New York quotations on electrolytic heing from 14 to 14⅛c per pound, delivered. Quotations at Montreal and Toronto are running close to $15.65 per cwt. for electrolytic.

No changes in steel products have occurred and husiness while not so good as a month ago continues fair. It is not known definitely yet just what increases in prices, if any, will be made hy the American steel companies following the elimination of the 12-hour day, but the new work schedule has had the effect of stimulating enquiries considerahly.

CURRENT CANADIAN MARKET QUOTATIONS ON CHEMICALS, GUMS, OILS AND METALS.

GENERAL CHEMICALS

Acetaldehyde, 99%, carlots, 20,000 lbs. and over	lb.	.15	—
Less than carlots	lb.	.16	—
Both quotations f.o.b. Shawinigan Falls, Que.			
Acetone, pure, drums or over	lb.		— .34
Lesser amounts	lb.		— .40
ACID—			
Acetic, 28%, car. lots	100 lbs.		— 5.05
28%, 25 bbl. lots	100 lbs.		— 5.30
28%, 10 bbl. lots	100 lbs.		— 5.55
28%, 5 bbl. lots	100 lbs.		— 5.80
28%, 1 or 2 bbl. lots	100 lbs.		— 6.05
80%, carload lots	100 lbs.		—14.00
80%, 25 bbl. lots	100 lbs.		—16.00
80%, 15 bbl. lots	100 lbs.		—17.00
80%, 10 bbl. lots	100 lbs.		—17.25
80%, 5 bbl. lots	100 lbs.		—17.75
80%, 3 or 4 bbl. lots	100 lbs.		—18.75
80%, 1 or 2 bbl. lots	100 lbs.		—19.00
Glacial, bbls.	lb.		— .12
Carboys	lb.		— .12½
Boric, crystals, bbls	lb.		— .13
Boric, powder, bbls	lb.		— .12½
Benzoic	lb.	.85	— .90
Butyric, 98-99% pure, f.o.b. Shawinigan Falls	lb.	1.00	—
Citric, kegs	lb.	.55	— .60
Formic, 75%, carboys, 100 lbs.	lb.	.20	— .21
Gallic, tech	lb.	.50	— .55
Gallic, B. P.	lb.	1.25	— 1.50
Hydrochloric, 18°, carboys, 100 lbs	lb.	2.25	— 2.75
Hydrofluoric, 60%	lb.	.22	— .25
Hydrofluoric, 30%	lb.	.11	— .13
Lactic 44%, tech., light, bbl.	lb.		—
Lactic 22%, tech., light, bbl.	lb.		—
Muriatic, see acid hydrochloric.			
Nitric, 36°, carboys	100 lbs.	8.25	— 9.00
Oleic	lb.		— .26
Oxalic	lb.	.11	— .13
Phosphoric, 85%	lb.		— .28
Phosphoric, 50%	lb.		— .22
Pyrogallic, resublimed	lb.	2.00	— 2.10
Salicylic, tech., bbl	lb.	.47	— .48
Salicylic, B.P. bbl	lb.	.50	— .52
Sulphuric, 66°, carboys	100 lbs.	2.25	— 2.75
Sulphuric, 66°, tank cars, f.o.b. works	ton	23.75	—24.00
Stearic, double pressed	lb.	.22	— .24
Stearic, triple pressed	lb.	.25	— .27
Tannic, B.P.	lb.	.80	— .90
Tannic, tech	lb.	.45	— .55
Tartaric, crystals, bbls	lb.	.35	— .40
Tartaric, powder, bbls	lb.	.36	— .42
ALCOHOL, absolute Ethyl, case of 1 doz.	1 lb. bottle		— 3.15
In steel drums of 10 gals. capacity	Imp. gal.		—23.00
Acetone, bbls. or over	gal.		— 1.50
Lesser amounts	gal.		— 1.80
Aldehyde Ammonia	lb.		— .75
Alum, Ammonia, lump or ground	100 lbs.	3.75	— 4.50
Aluminium Sulphate, lump bags	100 lbs.	2.25	— 2.50
Ground, bags	100 lbs.	2.50	— 2.75
Iron, free	100 lbs.		— 4.00
Ammonia, aqua, 26°, carboys	lb.	.13	— .14
Drums	lb.		— .09½
AMMONIUM, Carbonate	lb.	.12	— .15
Chloride	lb.	.10	— .13
Amyl Acetate, tech	gal.		— 4.00
Pure	lb.		— .80
Arsenic, white	lb.	.13½	— .15
BARIUM, Sulphate, B.P.	ton		—60.00
Chloride	lb.	.06	— .08
Nitrate	lb.		— .16
Peroxide	lb.		— .26
Blanc fixe, dry, bbl	lb.		—
Pulp, bbl	ton		—
Bleaching Powd., 35%, drums	lb.	2.50	— 3.00
Borax, crystals	lb.	.05½	— .05¾
Bromine, tech	lb.		— .38
Benzaldehyde	lb.	1.35	— 1.60
Butylaldehyde	lb.	.60	—
CALCIUM ACID, Phosphate	lb.		— .07½
Carbide, ton lots, f.o.b. wks.	ton		—95.00
Carbide, less than ton lots	ton		—100.00
Chloride, fused	ton		—35.00
Chloride, flake	ton	48.00	—50.00
CAUSTIC SODA, flake, drms.	100 lbs.	5.00	— 5.50
Ground, drums	100 lbs.	5.00	— 5.50
Solid, drums	100 lbs.	4.25	— 4.75
CARBON BISULPHIDE, drums	lb.	.10	— .12
Tetrachloride, drums	lb.		— .18
Chlorine, liquid, in cylinders of 150 lbs	lb.	.08	— .09
Cobalt Oxide, black	lb.		— 2.00
Grey	lb.		— 2.25
Copperas, crystals	lb.	.02	— .02½
Sugar	lb.	.02	— .02½
Copper Sulphate (blue vitriol)	lb.	.07½	— .08
Corrosive Sublimate	lb.	1.00	— 1.50
Cyanide, Crude	lb.		— .22
Dextrine, potato	lb.		— .06
Corn	lb.		— .08½
ETHER, B.P. (conc.)	lb.		— .55
Sulphuric	lb.	.30	— .35
Ferric Chloride, crystals	lb.	.08½	— .09
Solution	lb.		— .06
Formaldehyde, bbls. or over	lb.		— .19½
200-lb. kegs	lb.		— .24½
100-lb. kegs	lb.		— .25½
50-lb. kegs	lb.		— .26½
Fullers' Earth, powder	100 lbs.	2.00	— 2.50
Car lots, f.o.b. Toronto	ton		—30.00
Fusel Oil, special, refined	gal.	4.00	— 4.50
Glycerine, crude, drums	lb.		— .15
Crude, single tin of 56 lb.	lb.		— .17
C.P., single tin of 56 lbs.	lb.		— .27½
C.P., two or more tins	lb.		— .25½
C.P. drums, 500-1,000 lbs.	lb.		— .19½
Pale straw, drums, 500-1,000 lbs	lb.		— .18½
Pale straw, single tin 56 lb.	lb.		— .26½
Pale Straw, 2 or more tins	lb.		— .24½
Hexamethylene Tetramine	lb.	.90	— .95
Hydrogen Peroxide	gal.		— .75
Iron Oxide, red, casks	lb.	.13	— .20
LEAD, Acetate	lb.	.14	— .16
Nitrate	lb.	.14	— .15
Lime, grey	ton		—14.30
Grey, in car lots	ton		—11.70
Hydrated, in ton lots	ton		—20.00
Litharge	lb.	.09	— .10
Lithopone	lb.		— .07½
Magnesite, Calcined	ton		—30.00
Clinkered	ton		—35.00
Raw	ton		—10.00
MAGNESIUM, Carbonate, bbls.	lb.	.14	— .16
Sulphate, B.P.	ton	60.00	—70.00
Technical, car lots	ton	35.00	—40.00
Methyl Hydrate (wood Alcohol), 95%, bbls. or over	gal.		— 1.15
95%, half-bbl. lots	gal.		— 1.25
95%, lesser amounts	gal.		— 1.30
97%, bbls	gal.		— 1.20
97%, half-bbl. lots	gal.		— 1.35
97%, lesser amounts	gal.		— 1.50
Nickel Salt, single, in bbl. lots.	lb.		— .13½
Single, per cwt	lb.		— .15
Double, barrel lots	lb.		— .14
Double, per cwt	lb.		— .15½
Phosphorus, yellow	lb.		— .34
Potash Prussiate, yellow	lb.	.33	— .36
POTASSIUM, Bicarbonate	lb.		— .20
Bichromate	lb.	.15	— .16
Carbonate, calc. 80-85%	lb.		— .14
Chlorate	lb.		— .12
Citrate	lb.	.90	— 1.00
Hydroxide (caust. potash) sticks			— .45
Hydroxide (caustic potash), small drums	lb.	.12	— .14
Hydroxide (caustic potash) large drums	lb.	.11	— .12
Nitrate, casks	lb.	.08½	— .09
Permanganate, bulk	lb.	.19	— .20
Red Precipitate (mercuric ox.)	lb.		— 1.75
Silver Nitrate	lb.		— 9.00
Soda Ash, bags	cwt.	2.25	— 2.40
SODIUM, Acetate, ton lots or ov.	lb.		— .06
Lesser amounts	lb.		— .06½
Aluminium Phosphate	lb.		— .03½
Benzoate	lb.	.70	— .75
Bicarbonate, 100% pure	lb.	2.50	— 3.00
Bichromate, bbls	lb.	.10	— .13
Bisulphite, powder	lb.	.05½	— .06
Bisulphite, 35 Be	lb.	.03	— .03½
Bromide (foreign)	lb.		— .28
Cyanide, bulk, 98-99%, in cases	lb.		— .34
Fluoride, 95-98%	lb.	.15	— .16
Hyposulphite, kegs	100 lbs.	4.75	— 5.00
Barrels	cwt.	4.00	— 4.50
Iodide	lb.		— 5.20
Nitrate, refined	cwt.	6.75	— 7.00
Crude, 95%	cwt.	5.25	— 5.75
Nitrite	lb.	.12	— .15
Perborate, U.S.P.	lb.	.35	— .40
Peroxide, f.o.b. New York	lb.	.25	— .27
Silicate, 42°, car lots	cwt.		— 1.35
Smaller lots	cwt.		— 1.55
Silicate, 40°, car lots	cwt.		— 1.25
smaller lots	cwt.		— 1.45
Sulphide, 60-62% fused, drums car lots	lb.	.05	— .05½
Sulphate (Glauber's Salts), crystals, in bags	cwt.	1.80	— 2.00
Car lots	cwt.	1.65	— 1.75
Sulphite	lb.		— .02
Prussiate, yellow	lb.	.14	— .16
Sulphur, ground	100 lbs.	2.50	— 2.75
Roll	100 lbs.	4.25	— 4.75
Talc, No. 1 grade	ton		—30.00
No. 2 grade	ton		—25.00
No. 3 grade	ton		—23.00
Tin Chloride, crystals	lb.	.30	— .35
Tri-Sodium Phosphate	lb.	.07	— .07½
Ultramarine, blue	lb.	.10	— .29
White Precipitate (mercuric-Ammonium chloride)	lb.	1.90	— 2.00
Whiting (English)	ton		—30.00
(American)	ton		—28.00
ZINC, Sulphate, com	lb.	.05	— .05½
Dust	lb.	.13	— .14½
Oxide, lead free	lb.	.11	— .12
Stearerate	lb.	.30	— .35

PHARMACEUTICAL CHEMICALS

AMMONIA, Aqua, C.P	lb.		— .22
Iodide	lb.		— 6.25
Asperin, 100 lb. lots, bulk	lb.	.85	— .95
Caffeine, English	lb.		— 3.50
Calomel (mercurous chloride	lb.	1.55	— 1.60
Camphor, Monobromate.	lb.		— 2.60
Refined, slabs	lb.		— 1.28
Refined, Tab	lb.		— 1.32
Carbolic Acid, white crystals	lb.	.45	— .45
Chloroform	lb.	.40	— .45
Coumarin	lb.	3.75	— 4.00
Cream Tartar, 98%	lb.	.25	— .30

Ether, B.P.	lb.		— .55
Iodine, crude	lb.	4.50	— 4.75
Resublimed	lb.	5.50	— 5.60
Lithium Carbonate	lb.	1.80	— 2.10
Potassium Bromide, crystals	lb.	.17	— .19
Granular	lb.	.17	— .19
Iodide	lb.		— 4.50
Phenacetin	lb.	1.75	— 2.00
Phenolphthalein	lb.		— 1.75
Quinine	oz.	.70	— .75
Saccharin	lb.	1.75	— 2.25

SYNTHETICS

Benzyl, Acetate	lb.		— 1.75
Benzoate	lb.		— 1.75
Citral	lb.		— 4.50
Coumarine	lb.		— 3.50
Heliotropine	lb.		— 5.00
Linalyl Acetate	lb.		—13.50
Methyl Salicylate	lb.		— .75
Musk, Xylol	lb.		— 3.00
Teyseniol	lb.		— 1.00

ESSENTIAL OILS

Anise	lb.		— .80
Bay	lb.		— 3.00
Bergamot	lb.		— 4.50
Cajaput	lb.		— 1.25
Camphor, white	lb.		— .50
Brown	lb.		— .25
Cassia	lb.		— 2.00
Cedar Leaf	lb.	1.90	— 2.00
Cedar Wood	lb.		— .50
Citronella, Ceylon	lb.		— .60
Java	lb.		— .85
Clove	lb.		— 2.25
Eucalyptus	lb.		— .65
Geranium Bourbon	lb.		— 7.50
Lavender	lb.		— 5.00
Spike	lb.		— 1.25
Lemon	lb.		— .75
Lemongrass	lb.		— 1.35
Lime, distilled	lb.		— 1.00
Orange Sweet, Sicilian	lb.		— 3.50
West Indian	lb.		— 3.00
Peppermint, American	lb.		— 3.50
Japanese	lb.	1.75	— 2.00
Redistilled, B.P.	lb.	4.00	— 4.25
Pathouli	lb.		—10.00
Otto of Rose	oz.		— 6.50
Rosemary	lb.		— .65
Sandalwood	lb.		— 7.50
Sassafras	lb.		— 1.75
Thyme	lb.		— 1.45

VEGETABLE OILS

Castor Oil, No. 3, bbl.	lb.	.16½	— .17½
No. 1, bbl.	lb.	.18	—
Chinawood Oil	lb.		— .27
Cocoanut, Ceylon, bbl.	lb.		— .11
Cochin, bbl.	lb.		— .12½
Corn Oil, bbls.	lb.		— .12
Tank cars	lb.	.10	— .10½
Cottonseed Oil, crude, f.o.b. U. S. mills, tanks	lb.	.10	— .10
Summer, yellow, bbl.	lb.	.12	— .12½
Winter, yellow, bbl.	lb.	.13	— .13¼
Linseed Oil, 1 to 2 bbls., Raw, per gal. of 9 lbs.			— 1.25
3 to 5 bbls., Raw, per gal. of 9 lbs.			— 1.24
6 to 9 bbls., Raw, per gal. of 9 lbs.			— 1.22
Boiled Linseed Oil, 3c. per gal. higher than raw			—
Monopole Oil	lb.	.07	— .16
Olive Oil, foots	lb.	.12	— .14

GUMS

Arabic, clear amber sorts	lb.		— .20
Regular grain No. 4 and No. 5	lb.		— .28
Regular grain No. 2	lb.		— .31
White sorts	lb.		— .35
Powdered, No. 1	lb.		— .40
Powdered, No. 2	lb.		— .39
Indian, No. 1A	lb.		— .28
No. 1	lb.		— .25
Tragacanth, No. 1, ribbon	lb.		— 3.00
No. 1, flake	lb.		— 2.00
Turkey	lb.		— 2.00

VARNISH RESINS

Congo, sorts	lb.	.10	— .11
Hard amber	lb.	.11½	— .18
White	lb.	.35	— .45
Damar, Batavia	lb.	.35	— .38
Singapore, No. 1	lb.	.39	— .45
Singapore, No. 2	lb.	.20	— .24
Singapore, No. 3	lb.	.09½	— .12
East India, pale bold	lb.	.22	— .25
Pale nubs	lb.	.15	— .17
Pale chips	lb.	.07	— .12
Black bold	lb.	.09	— .12
Black nubs and chips	lb.	.05	— .0[illegible]
Kauri, XXXXX	lb.	1.60	—
XXXX	lb.	1.25	—
XXX	lb.	1.10	—
XX	lb.	.90	—
X	lb.	.80	—
No. 1	lb.	.67	— .70
No. 2	lb.	.45	— .50
No. 3	lb.	.25	— .30
B. X.	lb.	.55	— .65
B. 2	lb.	.30	— .35
No. 1 chips	lb.	.22	— .27
Brown chips	lb.	.15	— .20
Dust	lb.	.10	— .15
Manila, Bold XXXXX	lb.	.21	— .23
Nubs, pale	lb.	.18	— .22
Nubs, amber	lb.	.10	— .18
Soluble A	lb.	.16	— .18
Soluble chips	lb.	.10	— .12
Pontianac Bold	lb.	.20	— .30
Genuine nubs	lb.	.14	— .17
Genuine chips	lb.	.10	— .12

WAXES

Bayberry	lb.	.35	— .38
Beeswax, white, pure	lb.		— .38
African	lb.		— .30
Brazilian	lb.		— .34
Chilean	lb.		— .35
Refined	lb.		— .31
Candelilla	lb.	.40	— .42
Carnauba, No. 1, bags	lb.		— .50
No. 2, North Country	lb.		— .32
No. 3, North Country	lb.		— .22
No. 3, chalky	lb.		— .21
Ceresin, white	lb.		— .12½
Yellow	lb.		— .12
Japan	lb.	.19	— .20
Montan, crude	lb.	.06	— .07
Ozokerite, crude, brown	lb.	.16	— .17
Black, 158°—160°, M.P.	lb.	.18	— .19
Paraffin, 128°—130°, M.P., 250 lb. lots	lb.		— .06
118°—120°, M.P., 250 lb. lots	lb.		— .05
Parowax, blocks, 100 lb. lots	lb.		— .08¼

SHELLAC

T.N.	lb.		— .85
Superfine Orange	lb.		— .90
A. C. Garnet	lb.		— .82
Bone Dry	lb.		— .99

NAVAL STORES, FLOTATION OILS

Pine Tar Oil, crude	gal.		— .60
Refined	gal.		— .65
Rosin, G., 280 lb. bbl. lots	bbl.		— 8.25
W.W., 280 lb. bbl. lots	bbl.		—10.00
Turpentine, 1 bbl. lots	Imp. gal.		— 1.50
2 to 4 bbl. lots	Imp. gal.		— 1.47
Less than bbl. lots	Imp. gal.		— 1.60

PETROLEUM OILS AND DISTILLATES

Mid-Continent Crude, 42 W. gal.	bbl.		— 1.45
Pennsylvania Crude, 42 W. gal	bbl.		— 2.75
Coal Oil	gal.		— .19
Fuel Oil, bbls.	gal.		— .10.7
Tank cars	gal.		— .08.7
Gasoline, motor	gal.		— .25
Service stations	gal.		— .29
Gasoline, lighting	gal.		— .30
Naphtha	gal.		— .24

COAL TAR PRODUCTS

Alpha—Naphthylamin	lb.	.46	— .48
Benzol, 100%	Imp. gal.		— .55
90%	Imp. gal.		— .50
Carbolic Acid, crude, 25%	gal.		— .44
Creosote Oil, crude	gal.		— .40
Refined	gal.		— .60
Coal Tar, crude	bbl.		—10.25
Refined	bbl.		—11.50
Coal Tar Pitch, bbls	cwt.		— 2.00
Cresol, U.S.P., f.o.b. N.Y.	lb.	.25	— .29
Dip Oil, 25%, f.o.b. N.Y.	gal.	.25	— .30
H. Acid, f.o.b N.Y.	lb.	.75	— .80
Phenol, drums	lb.	.60	— .65
Pyridine, f.o.b. N.Y.	gal.	4.00	— 4.25
Resorcinol, tech, f.o.b. N.Y.	lb.	1.50	— 1.60
Pure, f.o.b. N.Y.	lb.		— 2.25
Naphthalin, flake	lb.		— .07
Balls	lb.		— .08
Solvent Naphtha, refined	gal.		— .48
Toluol, pure	gal.		— .54
Xylene, pure, f.o.b. N.Y.	gal.	.65	— .90
Comm., drums, f.o.b. New York	gal.		— .37

FERTILIZER MATERIALS

Acid Phosphate	ton	$28.00	—30.00
Animal Tankage, per unit of ammonia			— 3.50
Per unit of bone phosphate of lime			— .10
Nitrate of Sode		70.00	—75.00
Muriate of Potash	ton		—40.00
Pure Ground Blood, per unit of ammonia			— 4.00
Steamed Bone Meal	ton		—50.00
Sulphate of Ammonia	ton	68.00	—70.00

TANNING AND DYEING MATERIAL

Chestnut Liquid Extract	lb.	.02½	— .03½
Fustic Crystals	lb.	.24	— .28
Ground Sumac	ton	70.00	—75.00
Hematine Crystals	lb.	.18	— .22
Hemlock Liquid Extract	lb.	.03½	— .04
Liquid Sumac Extract	lb.	.06½	— .07½
Logwood, Solid	lb.	.16	— .19
Quebracho Liquid Extract	lb.	.03½	— .04
Quercitron Liquid Extract	lb.	.07	— .08

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The following quotations on Rubber are in American funds, New York delivery:—

Para, upriver fine	lb.	$	— .26½
Upriver, coarse	lb.		— .24
Caucho ball	lb.		— .25
Plantation, 1st latex crepe	lb.		— .27
Ribbed smoked sheets	lb.		— .27
Brown crepe, thin, clean	lb.		— .25½
Amber crepe, No. 1	lb.		— .26½

MISCELLANEOUS MATERIAL

Asbestos, crude, No. 1, f.o.b. Quebec	ton		—500.00
Shingle, f.o.b. Quebec	ton	65.00	—80.00
Cement, f.o.b. Quebec	ton	21.00	—25.00
Barytes, floated	ton	30.00	—36.00
Crude, f.o.b. mines	ton	10.00	—11.00
Casein, tech., bbls.	lb.	.28	— .30
China Clay, f.o.b. Huberdean, Que., car lots	ton	17.00	—18.00
Imported	ton	20.00	—23.00
Feldspar, No. 1, f.o.b. mill	ton		—22.00
Firebrick, Scotch, depending on grade	M.	70.00	—80.00
American, depending on grade	M.	75.00	—90.00
Fluorspar, ground	ton	25.00	—28.00
Graphite, crude high grade	ton	35.00	—40.00
Ceylon, lump	lb.	.06	— .06½

INDUSTRIAL GASES

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Red	lb.		— .16½
Rods	lb.		— .19
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Casting, car lots	cwt.		—14.65
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Black sheet, 28 gauge, size 36"	cwt.		— 5.75
Sheets, galvanized, 28 gauge, 30"	cwt.		— 6.75
Blue sheets, base	cwt.	4.50	— 4.60
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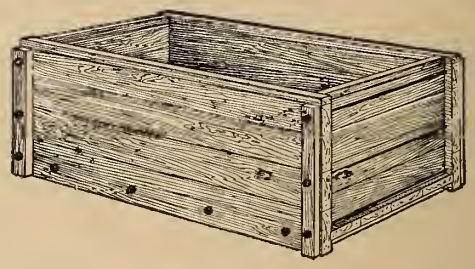

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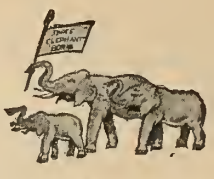
BORAX  BORAX

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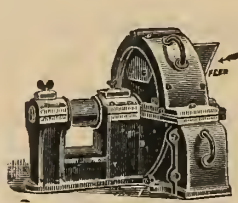

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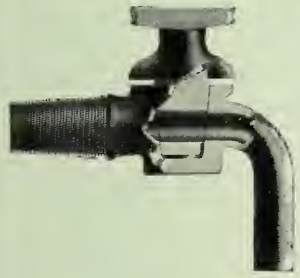

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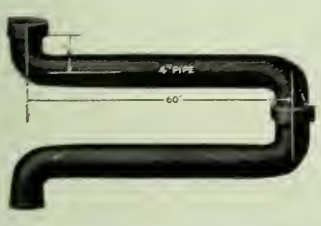

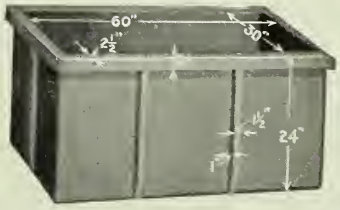

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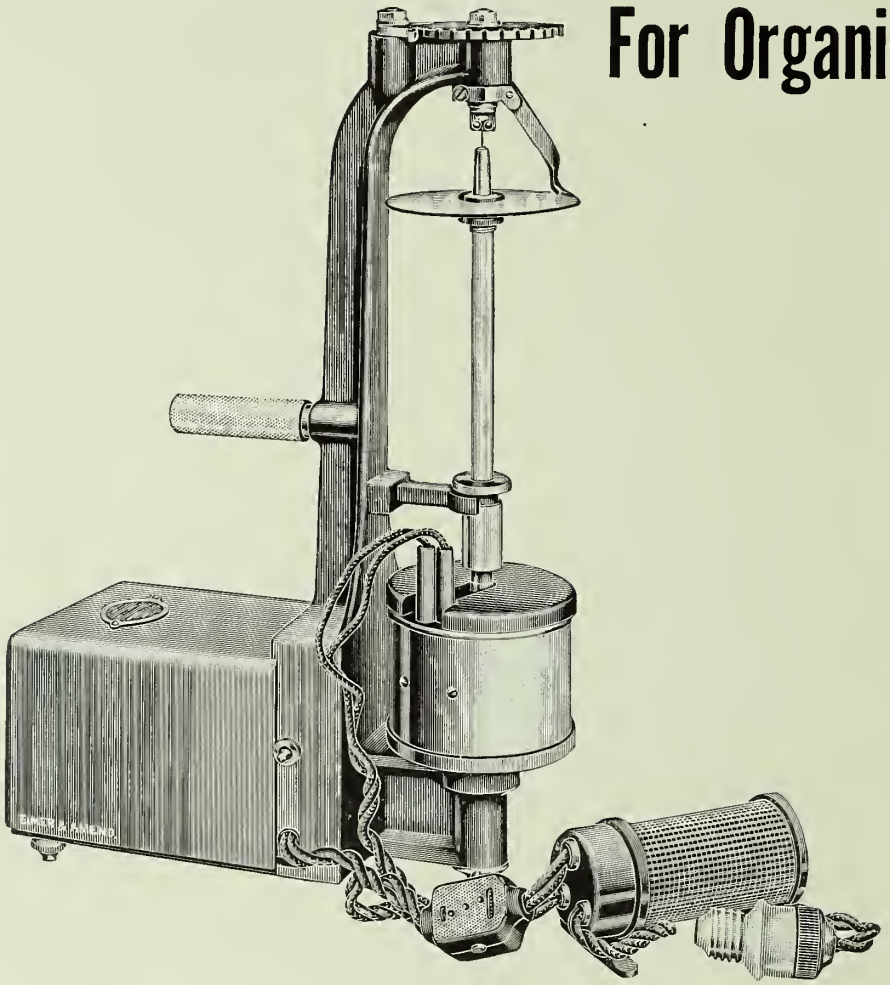

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Product		1921 Quantity	1921 Value	1922 Quantity	1922 Value
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Gold	ounces	709,509	$14,624,085	$1,000,199	$20,674,109
Silver	"	8,412,059	5,497,160	9,167,846	6,491,271
Platinum metals (a)	"	915	51,060	642	38.884
Copper	lbs.	3,070,719	356.708	4,503,358	515,093
Nickel, metallic	"	5,430,147	1,825.359	11,175,326	3,171,434
Nickel, oxide	"	1,402,019	285,391	2,399,887	391,119
Cobalt, metallic	"	32,718	98,228	109,067	282,602
Cobalt, oxide	"	155,554	354,418	398,697	798,271
Other nickel and cobalt compounds and residues	"	108,814	114,069	1,070,935	255,034
Copper in matte exported (b)	tons	3,686	737,142	7,774	1,554,731
Nickel in matte exported (b)	"	4,850	1,939,851	8,689	3,475,649
Iron and briquettes (c)	"	100	459	4,304	25,261
Iron, pig (d)	"	82,838	2,079,729	14,052	340,730
Lead, pig	lbs.	3,570,222	190,843	2,895,695	173,742
Zinc (e)	"	.....	.....	100,283	2,181
Total metallic		.....	$27,574,202	.....	38,190,711
NON-METALLIC					
Actinolite	tons	78	$ 975	$ 50	$ 345
Apatite (Phosphate of Lime)	lbs.	.....	.....	31	248
Arsenic, white	"	2,982,525	233,763	4,118,695	299,940
Arsenate of Iron	"	.....	.....	75,000	938
Corundum	tons	402	50,250	.....	.....
Feldspar, crude and ground	"	15,506	114,059	15,515	94,985
Fluorspar	"	115	1,744	284	3,905
Graphite, crude and refined	"	363	23,273	626	34,124
Gypsum, crushed, ground and calcined	"	84,765	433,053	110,227	621,668
Iron Pyrites	"	19,375	91,604	11,235	39,763
Mica	"	222	29,630	2,229	56,480
Mineral water	Imp. gals.	.....	9,000	31,970	6,118
Natural gas	M. cu. ft.	8,590,000	2,953,000	7,919,390	3,902,800
Peat	tons	500	2,000	3,000	14,500
Petroleum	bbls.	172,859	466,716	164,732	439,286
Quartz and silica brick	tons	12,957	74,635	82,882	149,302
Salt	"	149,599	1,509,287	161,551	1,537,512
Talc., crude and ground	"	9,967	140,390	12,874	178,397
Construction Materials—($11,527,529)—					
Cement, Portland	bbls.	2,723,072	6,425,266	3,104,386	6 235,370
Lime	tons	91,355	1,172,680	116,769	1.315,479
Sand and gravel	cu. yds.	1,412,956	668,098	2,132,875	1,001,088
Sand-Lime brick	M.	.....	456,700	48,924	770,597
Stone, building, trap, granite	.....	.....	1,812,863	.....	2,205,025
Clay Products—($5,103,618)					
Brick, common	M.	99,463	1,743,094	105,536	1,803,349
Brick, pressed	"	31,481	673,087	44,892	900,111
Brick, tapestry or rug	"			22,453	514,666
Tile, drain	"	9,910	250,040	10,110	260,312
Tile, building and floor	.....	.....	211,529	.....	562,566
Pottery	.....	.....	67,985	.....	88,889
Sewer pipe	.....	.....	939,464	.....	973,824
Total non-metallic		.....	20.554,185	.....	24.011,458
Add metallic		.....	27,574,202	.....	38,190,711
Grand Total		.....	$48,128,387	.....	$62,202,169

(a) Recoveries from Canadian and United States refineries. (b) Copper and nickel exports in the form of matte were valued, respectively, at 10 and 20 cents per pound. (c) Exports and shipments to points other than Ontario blast furnaces. (d) Proportional product from Ontario ore smelted. (e) Recovery from concentrates shipped in 1919 and not previously reported.

Dividends and Bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies, or a total of $114,334,884.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

For illustrated reports, geological maps, mining laws, and list of publications, apply to Thomas W. Gibson, Deputy Minister of Mines, Parliament Buildings, Toronto, Ont.

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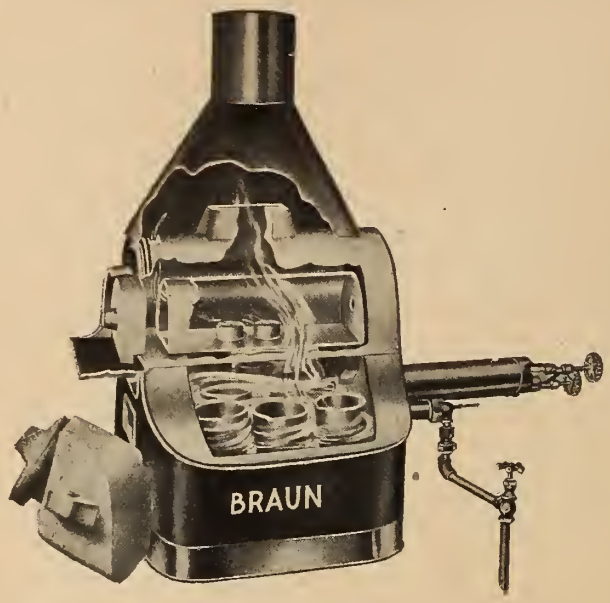

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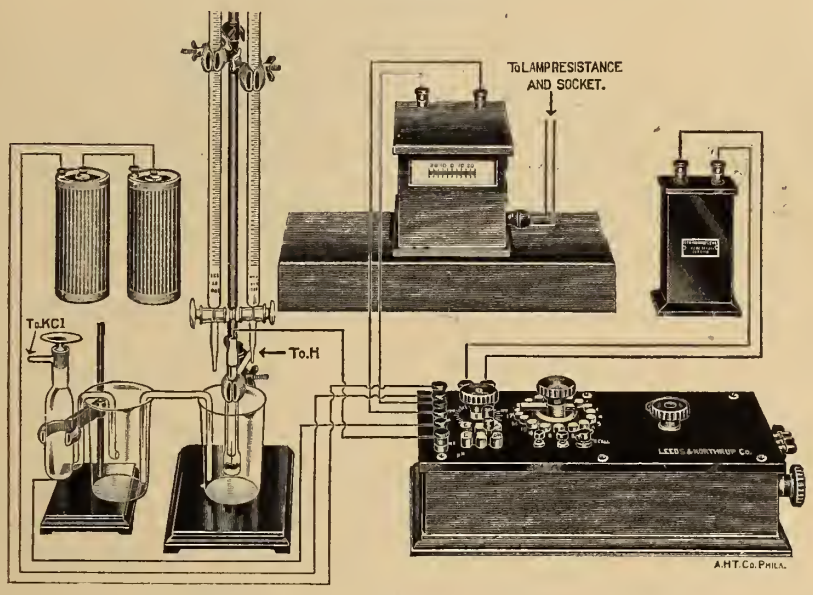

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4797.	Lamp Resistance for Galvanometer, for 110 volts	5.00	*Exzmd*
4822.	Eppley Standard Cell	15.00	*Eygmu*
4852.	Hildebrand Hydrogen Electrode	6.75	*Eysnf*
4834.	Calomel Electrode Vessel	3.85	*Eylhz*

			Code Word
2090.	Burgess Super-six Dry Cells (2)	$ 1.80	*Asauz*
9336.	Support, large	1.30	*Olkyi*
2410.	Paired Burettes, 50 ml, for titrating	8.00	*Beuyz*
3220.	Clamps (3)	1.20	*Cutxu*
2128.	Beakers, Pyrex glass, 300 ml (2)	.52	*Ataoj*
9357.	Support	1.50	*Ombiw*
3218.	Clamp	.70	*Cuteh*
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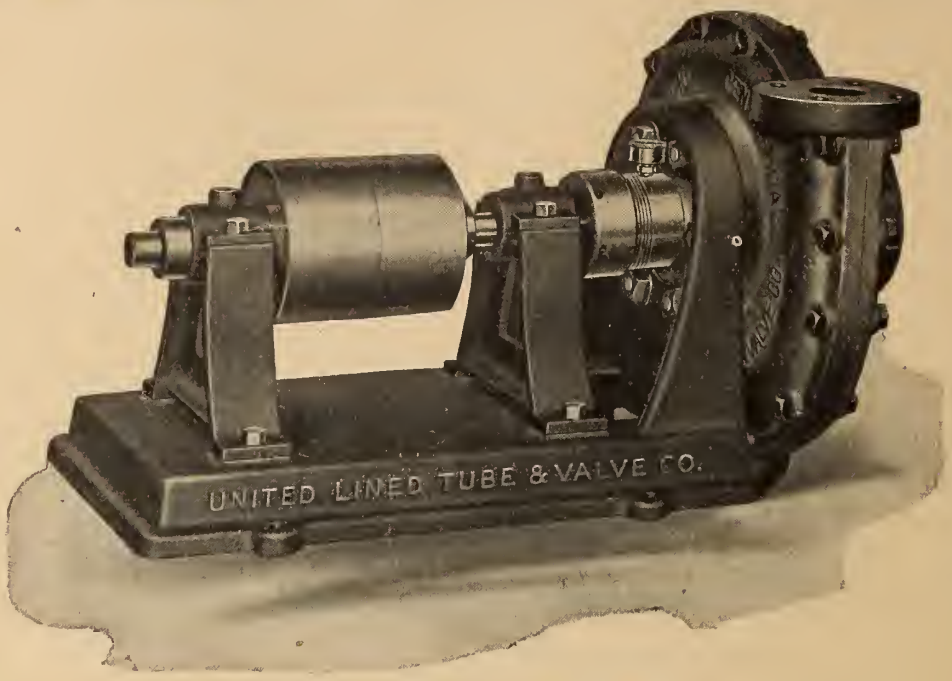

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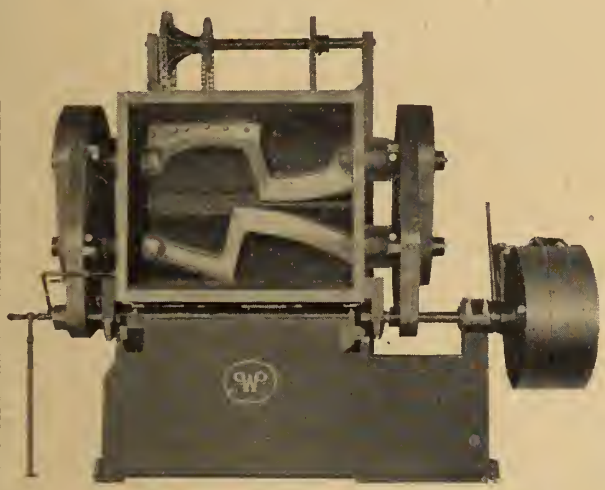

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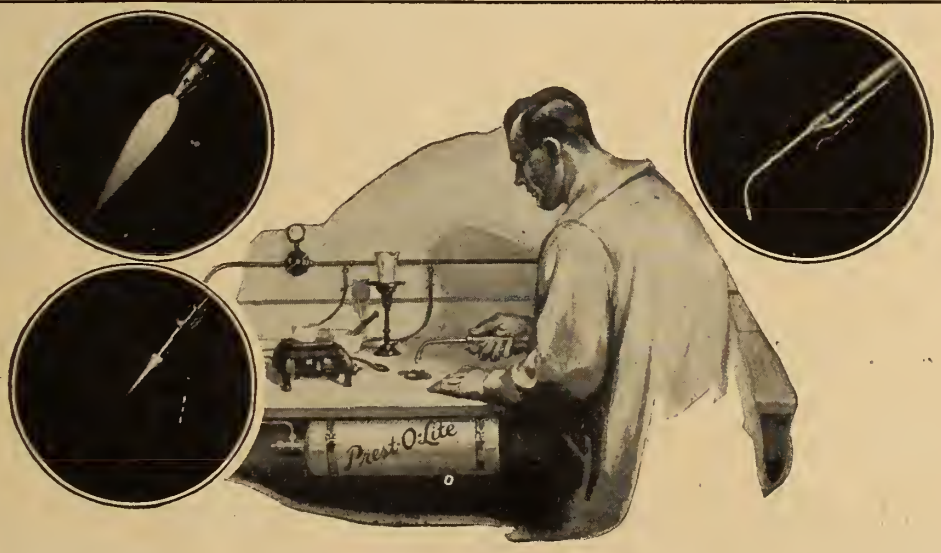

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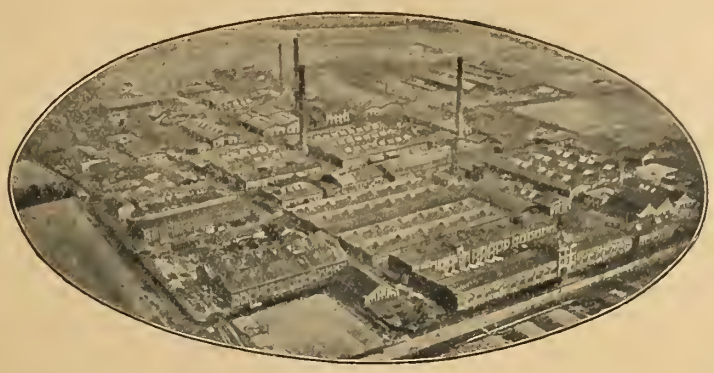

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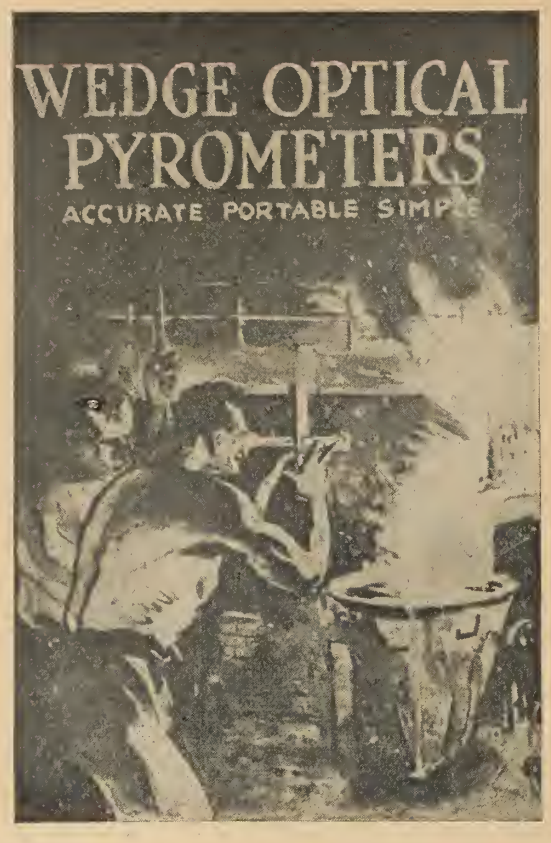

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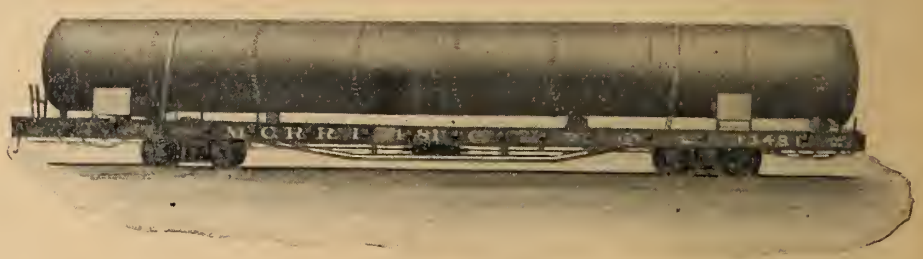

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From the Publishers—

Service Through a Canadian Chemical Paper----II

In the last issue, the service of a chemical paper in Canada was outlined, from the general standpoint of the reader. One of the particular services that this paper renders is to the chemist or purchasing agent who wishes to know the price of a given chemical product. The prices in London and New York are basic, but so many costs enter between these figures and a price at any Canadian point, that it is a real service to quote chemical prices in terms of Canadian money and delivery. Gradually, a Canadian market price will be developed for more individual products, as we produce them. These prices are, on the whole, accurate, but, like all printed prices, are the quotation of sellers. In all sales, many factors enter the price; but prices printed in CANADIAN CHEMISTRY AND METALLURGY are the regular market quotations of Canadian manufacturers or dealers, in terms of Canadian funds, at large Canadian centres, if such data is available. If foreign prices are quoted the fact is stated. If you are interested in special prices, for special quantities or unusual materials, we have a service, giving this information to any subscriber. Why not use our prices more?

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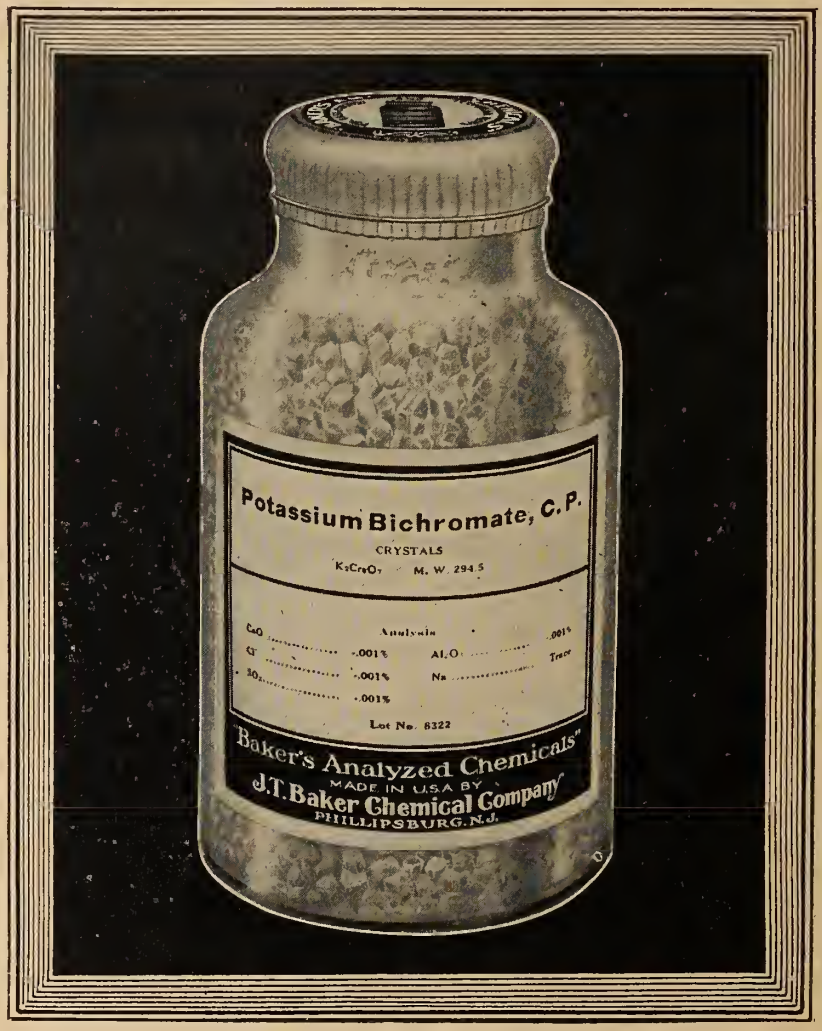

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CONTENTS Issue—No. 39—Issued June 1st

Determination of Diastatic Strength, Malts and Malts Extracts, by Dr. C. A. Munsterman; Note on Precipitation of Copper, by A. W. Beshgetoor; Analysis of Refined Tin, by W. H. Jacobson; Notes on Carbon Determination by Combustion, by D. N. Strickland; Estimation of Sulphide and Thiosulphate When Present Together in Solution, by Jos. W. Coxe, Jr.; Note on Folding Filter Paper, by A. Regenbrecht.

EDITORIALS

INSTITUTE LEADERSHIP

GRADUALLY, but none the less surely, the Canadian Institute of Chemistry is taking hold of the profession in Canada in a business-like constructive way. The significance of regular meetings of the Council of the Institute should not be overlooked. This body recently spent a full day discussing matters of general professional interest. While some details of this meeting are reported elsewhere, it is probably not generally appreciated to a sufficient extent that there does exist an organization keenly awake to the interests of Canadian chemists and that there are regularly elected representatives prepared to devote a considerable amount of their time and thought to the working out of problems which will never straighten themselves out alone.

In Canada as in no other country is there such a splendid opportunity to build up a united chemical profession on a proper basis. In England there exists such a residue of various developments that it is now exceedingly difficult to unify or correlate the affairs of chemists. In the United States, until very recently, there has been no move of importance which considered the professional development of the chemist.

It is reasonable to suppose that the Institute in Canada may undertake a wider range of activities than seems possible in older and larger countries. For example, chemists are interested in the teaching of chemistry in Universities and various grades of schools. While it might be a very bold stroke for one organization to consider in a general way the teaching of chemistry in some countries, it is possible for the Canadian Institute to concern itself if need be with the question, since the Institute has within its membership a large number of the leading teachers in our universities and can attract representative teachers from all provinces. These do not as yet make an unwieldy number and it should be relatively easy for the Institute to be influential in the teaching of the subject in all its phases as so many members are former pupils.

There is a natural tendency to look around for established examples and direction rather than to undertake pioneer work. In reality the Canadian Institute seems to be viewed by the chemists of other countries as presenting a wonderful opportunity because it has been developed relatively early in our industrial history. Our own chemists should realize this and work out together something that will be a model indeed for the chemical profession throughout the world.

While the Institute has been developed and guided mainly by those mature in their profession and experience, it is essentially something that is being built for the future. It is the chemist of tomorrow who may hope to rest a little in the finished structure. For this reason the younger chemist of today might well be more active in influencing the development of something that is certain to concern him later to a greater degree.

CHEMISTRY AND LUBRICATION ENGINEERING

LUBRICATION as a science has developed in a most amazing manner, since it has become a subject of study in the domain of physical chemistry. When a chemist says that it is now recognized that solid surfaces, having an adsorbed layer of lubricant of only one molecule in thickness, can slide over each other with comparatively small frictional resistance, he has the engineer of yesterday, and most of those now passing as such, quite off their stride. Lubrication has been reduced apparently to a matter of molecules, their general appearance, and many other factors hitherto quite unsuspected.

Lubricants are reduced, therefore, to two essential types. In one case, the surfaces are separated by a film of lubricant many hundreds of molecules in thickness, so that the resistance of relative motion of the surfaces is due to the lubricant in mass and the effect of the reaction at the two interfaces of lubricant and solid is negligible. In the other type, the molecular reaction at the common boundary constitutes the whole of the resistance. This resistance, is therefore, a function of the nature of the surfaces, and the chemical constitution of the lubricant. This latter type has been called "boundary" lubrication, and it appears that this depends on factors other than those of pressure and area of contact. Indeed, it has been recently associated with motion of a reciprocating character. In this way, a general rule is set up whereby this type of lubrication may be recognized. Further still, the question of grooving has received recent attention, and results appear to indicate that, for this type of motion, a liberal amount of grooving is necessary. Thus it is that anti-friction metals cease to be frauds, if boundary lubrication be admitted. On top of all this, the discovery that small amounts of organic acids, added to mineral lubricating oils, very considerably reduce the coefficient of friction, gives the chemist, along with the physicist, a new status in this branch of engineering.

The above is written with the thought that there are many chemists, as well as engineers, who have a wonderful opportunity before them to improve

lubrication practice in their works. Enlarge upon the few simple cook-book tests you may make which have their place, and begin to really study, classify and survey your lubrication problems. By putting your chemistry and engineering together, there should be wonderful opportunities in most places to improve practice.

Much has been printed by producers of lubricants about the "scientific" way in which their products are made. It is becoming quite fashionable to create the idea that a tremendous amount of testing and care is given in making oils and lubricants. some of this is real, and much of it overdone. But the opportunity is there, and it is mainly for the chemist in the plant to set himself the task of becoming a master in lubrication engineering. On the average, he should know more about the subject than he does at present, and study not only the composition of what he buys, but the fundamental problems relating to proper lubrication for the types of machinery operated. A more intensive study of industrial lubrication will open up a larger field for chemistry and the chemist.

OUR NON-METALLIC AND CERAMIC INDUSTRY

SOME few months ago the Dominion Department of Mines was presented with a statistical service problem covering in general the consumption and uses of non-metallic substances in Canada. Obviously, no industry can be promoted or established without a true knowledge of potential markets.

This information had never been gathered, and the Department of Statistics through the mining, metallurgical and chemical branch, undertook the task and produced the survey in what appears to be record speed for such pioneer work. Within about three months, from the time the idea was conceived, a full report was available and a very complete advance abstract presented through this paper in the September issue.

In the whole matter, the Departments concerned are to be congratulated. In fact a new conception seems to be growing in Ottawa regarding the value of speed and detail in gathering and submitting technical and statistical information for industrial purposes. We still need more detail on imports, particularly chemical and allied materials.

Canada offers a growing market for specialized ceramic and non-metallic mineral products, but as usual difficulties appear. Our consuming industries are trained to use imported products. They wish no experiments: and here is one difficult condition that faces the home producer. Manufacturers in this line in Canada are frequently not quite as well advised in a technical way as they should be. They are easily satisfied with the products they produce. Their standards of quality are lower at times from causes that will probably not be obliterated until we have more technologists in close touch with the best European and American practices, methods, and research.

Individuals throughout our general clay working, non-metallic mineral using, and ceramic industries are keenly aware of conditions and have accomplished much in the last few years, but there is still great room for improvement. We should not be content to produce cheaper lines where competition from abroad may be impossible, but should aim to create construction and industrial products of the highest grade and quality, based on Canadian raw materials treated in Canada, just as rapidly as the application of science and good marketing methods will allow.

THE DEVELOPMENT OF A CODE OF ETHICS FOR CHEMISTS

A CODE of ethics is a measuring instrument, which, while it may be quite unnecessary for the conscientious chemist, and may be broken by the unscrupulous, is a confession of faith, to which there can be no possible harm in subscribing. A stated code becomes an embellishment to the profession, and gives the business world and the public a guarantee that the particular profession concerned is guided by sound principles, in all business relationships. It allows a governing body to measure the conduct of an individual member of the profession, and is, in all respects, the equivalent of a law, although no penalties, beyond ejection from professional association, may be imposed through transgression.

Everyone is familiar with such general rules of conduct, as form the basis of a code of ethics, and it should be a very simple matter to prepare a suitable code for chemists. Recently, the Engineering Institute of Canada has presented its members with a proposed code of ethics. The points covered are only those that are obvious to an individual who believes in the virtues of integrity and square-dealing with others in his profession and those who may employ him. The definite points of paying a commission for work, competition by reduction of the usual charge, and the giving of assistance to fellow engineers and students, are brought in.

Such a document is well worth the thought of the chemical profession in Canada, and no doubt the Canadian Institute of Chemistry will present its membership with a suitable code in due time. In the interval, we invite definite discussion of the matter, and if any chemist has worked out a first draft of a general code suitable for all chemists, it would seem to be an opportune time to bring it forward.

GETTING RESULTS QUICKLY

A METHOD for determining moisture in paper, as it runs off the machine, by measuring the resistance to the passage of an electric current, illustrates the direction we are going in mechanical devices to replace slow analytical methods. It has been found possible to make a scale wherein the moisture corresponding to various resistances can be read off directly, thus saving the time and trouble occasioned by tearing out a sample, weighing it, drying it, weighing again, and calculating.

Recall the old boiler test, with its barrel colorimeters, wheelbarrows, platform scales, and flue gas tests, and then go into a modern boiler-house, where the steam, coal, water, flue gas and efficiency may be read off dials at any time. And so with spectroscopes, refractometers and recording devices—the business of getting quick results is going on.

The modern chemist is not slow, except where accuracy demands it. He adopts the new system sometimes even before he should, and is really most progressive in using and developing new, better and quicker methods. If you are not quick to respond and investigate progress along new lines in analytical and plant work, you may be missing much that would be very helpful to you.

A BIENNIAL CHEMICAL SHOW

THE Chemical Exposition at New York was voted a very fair success by the majority of exhibitors. Gradually, the Exposition has become an equipment show. It is, of course, a commercial enterprise, and exhibitors are certain to be present or absent, according to the returns in sales or the particular publicity program they may be operating at the time.

For this reason, makers and distributors of chemicals, dyestuffs, and products essentially used in certain industries, or by the public, are, to a much lesser degree, attracted. Chemicals were largely represented; but this is the factor that makes it difficult to organize a real chemical exhibition, in the full sense of the term.

What the effect of calling off the Exposition for one year may be is problematical. There are many exhibitors who find that they cannot devise a show each year that is satisfactory to them, because their designs and products do not alter rapidly. They would like to have something new each time, and are not content to repeat exhibits of well-established lines. This is only a point of view, but it has an influence.

None of these troubles would be solved by any type of management, be it co-operative or otherwise. The big, outstanding problem facing the Chemical Exposition is the one which arises from the fact that chemists, chemicals, and chemical equipment now enter all industries, and every industrial show might have a chemical section. The Chemical Exposition itself, must, therefore, remain rather specialized, or become so inclusive that it can attract to definite sections those interested in the products required for specific industries. From the viewpoint of the customer, the departmental store idea must be developed from the present arrangement, where exhibits are mainly unclassified. This would superimpose upon a show designed for chemists and chemical engineers something arranged for the benefit of individuals interested in the products required for one industry only.

ACID-REFINED OR SILICA-JEL REFINED MOTOR BENZOL SATISFACTORY SUBSTITUTE FOR GASOLINE

Experiments in the operation of internal-combustion engines with motor benzol, conducted by the Department of the Interior at the experiment station of the United States Bureau of Mines at Pittsburgh, indicate that this type of fuel may serve as a satisfactory gasoline substitute when refined by the use of sulphuric acid or silica gel. The same tests developed the fact that crude motor benzol can not be used satisfactorily until after the removal of certain compounds which form gummy deposits and eventually stop the engine. No engine trouble whatever developed when acid-refined or silica gel refined motor benzol fuel was used.

Motor benzol is a by-product from the destructive distillation of coal. From $1\frac{1}{4}$ to 3 gallons of refined motor benzol is obtained per ton of coal carbonized.

It is estimated that 6,202,235,000 gallons of gasoline was produced during the year 1922. The crude light oil output during the same year is estimated at 111,000,000 gallons, or 1.8 per cent. of the gasoline production. If all the coal mined were coked in by-product ovens, and the light oil recovered therefrom this product would amount to only 15 to 20 per cent. of the quantity of the petroleum gasoline now produced annually. It is obvious therefore, that the light oils by present coking processes can not assume great importance as a gasoline substitute in a national sense. However, the use of light oil as a motor fuel is of real importance in districts adjacent to by-product coking operations from which a reasonable proportion of the local motor fuel supply may be derived. The certainty of diminution of petroleum resources in the relatively near future demands the utmost utilization of gasoline substitutes from the distillation of coal as well as other sources.

The Bureau of Mines considers that the engine tests made on motor benzol warrant constructive discussion regarding the present specifications which manufacturers of motor-benzol fuels endeavor to meet. Greater emphasis should be placed on the amount of evaporation residue, rather than on certain other present day specifications such as color. It appears also that the initial boiling point might be lowered slightly below 78 deg. C. Results of these tests are given in Serial 2517, by A. C. Fieldner, superintendent, Pittsburgh station, and G. W. Jones, assistant gas chemist, which may be obtained from the Deprtment of the Interior, Bureau of Mines, Washington, D.C.

Cobalt---Its Production and Uses*

By C. W. Drury.
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In Table I is given the production of cobalt ores in the various countries. The figures in the table are interesting, since they show the history of the mining of cobalt. The deposits of cobalt were small and often the metal was obtained as a by-product. Austria was the first large producer, followed by Germany, Norway and Sweden, Spain, Germany, New Caledonia and Canada. The consumption of cobalt compounds has gradually increased from that sufficient to supply the pottery industries of Europe, which would perhaps be approximately ten tons in 1860, to a world's supply of 400 tons in 1920. The use of cobalt compounds for coloring glass has been known by the Chinese for perhaps sixty or seventy-five years. No record is available of the production, but it must have been small. At present the Chinese import cobalt supplies from America. A few remarks summarizing the metallurgy of cobalt have been incorporated in the paper.

In Table II a list of the commercial compounds of cobalt showing the range in cobalt content, has been prepared.

Table I
Tons of Cobalt Ore Mined

Year	Germany	Austria	Norway	Sweden	New Caledonia	Spain	Canada
1856	6	136	....	....	....	....	....
1861	1	....	....	....	....	....	....
1871	18	....	25	....	....	4	....
1881	33	40	80	556	....	102	....
1891	576	....	187	244	....	60	....
1901	36	....	....	....	3,123	....	....
1904	41	....	....	....	8,964	....	16*
1909	....	....	....	....	979	....	1,533
1911	....	....	....	....	....	....	852
1916	....	....	....	....	....	....	400
1917	....	....	....	....	....	....	337
1918	....	....	....	....	....	....	380
1919	....	....	....	....	....	....	298
1920	....	....	....	....	....	....	283
1921	....	....	....	....	....	....	127
1922	....	....	....	....	....	....	221

*Figures for Canadian production are given in tons of cobalt metal.
For complete Table see report of Ontario Bureau of Mines XXVII, Part 3, 1918.

Ores

The mining of cobalt ores has been carried on in Europe for a considerable time, but no records of production are available previous to 1856. With the discovery of the cobalt deposits in Canada in 1903, the mining of cobalt ores in Europe and New Caledonia practically ceased. The mining of cobalt ore flourished best, previous to 1860 in Austria, in Germany between 1872-1876 and 1889-1893, in Norway from 1877 to 1893, in Sweden 1876-1893, and in New Caledonia between 1893 and 1908.

Cobalt ores are usually associated with nickel, iron, copper, and silver minerals. Bismuth, antimony, arsenic, sulphur, manganese and lead are also often present.

The ore of New Caledonia is a hydrated oxide of manganese, cobalt and nickel, high in iron. The ores of West Australia are practically free from nickel. In Africa at the Union Miniere du Haut Katanga, cobalt is associated with copper. In the United States at Fredericktown, Missouri, nickel, copper and lead are the chief metallic constituents of the cobalt ore. The ores of Cobalt, Canada, contain chiefly arsenic, antimony, iron and copper, and in addition, lead and bismuth.

The world's consumption of cobalt amounts to approximately 400 tons. The chief source of supply is Cobalt, Canada, but a small quantity (eighty to 150 tons)[1] has been obtained within the last two years from Queensland, West Australia. The shipments from Australia have been made in the form of a concentrate containing from twenty to thirty-three per cent. cobalt. The consumption is distributed between cobalt metal, oxide, and salts in about the following proportion: metal 175, oxide 200, salts twenty-five tons.

The tons of cobalt ore mined in the United States are not given separately, but the production of cobalt oxide has been recorded. Between 1870 and 1902, the quantity of cobalt oxide produced in the United States varied from 5,000 to 10,000 pounds per annum. In 1903 and 1908, the production increased to 120,000 and 100,000 pounds respectively. No further production has been reported until 1920 when 102,000 pounds was produced. These large recoveries were due to the operation of the Missouri mines and smelter.

The ores of Ontario continue to supply practically the world's requirements of cobalt. A few years ago, it was thought that the deposits of Belgian Congo would produce sufficient cobalt to satisfy the demands of Europe and Asia, but so far little, if any, has been recovered, and it is doubtful whether the recovery of cobalt from the copper ores would prove a commercial operation.

Table II
Composition of Commercial Cobalt Compounds

	Formula	Theoretical Per Cent. Cobalt	Per Cent. Cobalt in Commercial Product
Cobalt	Co	....	97.5
Cobaltous Oxide	CoO	78.65	75.0
Cobaltous Cobaltic Oxide	Co_3O_4	73.43	70.5
Cobaltic Oxide	Co_2O_3	71.00	....
Cobalt Acetate	$Co(C_2H_3O_2)_2.4H_2O$	23.70	23.0
Cobalt Borate	$2CoO.2B_2O_3.4H_2O$	32.60	30.0
Cobalt Carbonate	$CoCO_3$	49.58	43.5
Cobalt Chloride	$CoCl_2.6H_2O$	24.80	24.0
Cobalt Hydrate:			
Black	$Co(OH)_3$	53.64	50.+
Pink	$Co(OH)_2$	63.44	57–62
Cobalt Nitrate	$Co(NO_3)_2.6H_2O$	20.27	20
Cobalt Linoleate:			
Solid	$Co(C_{18}H_{31}O_2)_2$	9.56	7.–7.5
Liquid	....	....	5.0
Cobalt Phosphate	$Co_3(PO_4)_2.2H_2O$	43.92	41.0
Cobalt Resinate	$Co(C_{44}H_{62}O_4)_2$	4.31	1.5 (fused)
Cobalt Sulphate	$CoSO_4.7H_2O$	20.90	20–21
Cobalt Ammonium Sulphate	$CoSO_4.(NH_4)_2SO_4.6H_2O$	14.93	14.5
Cobalt Tungate stereoisomer of linoleate	....	9.56	....

Several reports concerning the deposits of West Australia have appeared in the technical journals. In 1922 a crushing and concentrating plant at a cost of $200,000 was constructed. To concentrate at a profit an ore for the cobalt content alone presents a difficult problem. It is true the ores of Cobalt, Canada, are concentrated, but the silver recovered is charged with the costs of operation. Unless the costs of mining, milling and refining the ores of West Australia are low, there will no doubt, be many difficulties to overcome before the deposits are fully developed.

Metallurgy

The common methods employed to treat cobalt ores are either chemical or smelting. The chemical method is employed more for the fairly pure ores, and consists generally in dissolving the

*Paper presented at Meeting of American Electrochemical Society, May 4th, 1923.

1. Mining Magazine, 26, 97 (1922).

metallic constituents of the ore in acid, followed by precipitations to remove the various metals and impurities. The smelting process which is used almost entirely on the ores of Cobalt, Canada, produces first a speiss. The speiss contains approximately thirty-five to forty per cent. cobalt and nickel, fifteen per cent. iron, thirty-five per cent. arsenic, and 1100 ounces of silver per ton, in addition to lead and copper.

The separation of the several metals in speiss from the cobalt presents numerous difficulties. These are due mainly to the similar properties of the three metals, iron, nickel and cobalt. It is impossible in a commercial operation to separate the previously mentioned metals by fire methods, by depending on the different degrees of oxidation or reduction. Therefore, in the standard process for treating speiss, all the constituents are dissolved in acid, sulphuric being commonly employed. The necessity of adding acid to dissolve all other metals in addition to the cobalt adds greatly to the cost. The similarity of the properties of the three metals still exists after being rendered soluble. Alkaline hydrates or carbonates, the cheapest precipitants, precipitate under ordinary conditions hydrates or carbonates of the three metals. The large quantities of iron, arsenic, and acid which must be removed retain considerable quantities of cobalt solutions, and are a source of heavy losses. For the foregoing reasons, it is necessary to operate on dilute solutions to effect anything approaching efficiency in the various precipitations.

The following figures show the extent of the removal of the impurities in the metallurgy of cobalt:—

Analysis	Co	Ni	Fe	As	S	Cu	SiO_2
Ore	5	4	10	14	7	1	20
Oxide	70.5	1.0	0.25	trace	0.1	0.03	0.2

The corrosive effect of solutions obtained at the different stages in the metallurgy of cobalt is serious. The handling of large tonnages containing sulphuric acid, copper and ferric sulphates presents a problem most difficult to solve. Practically every metal or alloy on the market has been tested in the solutions, but so far nothing has been found which will withstand the corrosion and abrasion. It may be of interest to the members of this Society to know in the production of one pound of cobalt it is necessary to handle 3000 pounds of solution.

After the sulphur, iron, arsenic and copper have been removed, the separation of the cobalt from nickel is the next operation. The cobalt is precipitated as cobaltic hydrate $Co(OH)_3$ by hypochlorite solutions. To get a pure product the oxide is dissolved and re-precipitated. In the precipitation of cobalt, chlorine is evolved, which is hard on the workmen, and the moist chlorine gas is very corrosive on exhaust fans and pipe lines.

The metallurgy of cobalt presents some interesting problems, to those engaged in the study of finding a suitable material to resist the combined corrosive effect of acid solutions of copper and ferric sulphates.

Recently a patent[2] was granted covering the treatment of cobalt ores with chlorine gas. It is planned to operate the process at the plant of the Coniagas Reduction Co., Thorold, Ont. Little is known at present of the details of the process, but it is understood that the arsenic and iron are volatilized as chlorides at certain temperatures.

Uses

Cobalt metal is used chiefly in the manufacture of stellite, and as one of the main constituents of permanent magnets. The superiority of stellite as a cutting tool has been definitely established. The addition of cobalt permits magnets[3] to be made of less than half the weight of those made of ordinary tungsten magnet steel.

The oxide is used mainly for coloring in the ceramic and enamel industries and in the preparation of cobalt salts. Cobalt salts are used as driers in paints and varnishes, as catalytic agents in the hydrogenation of oils, in the preparation of certain printing inks, and in stains in the ceramic industries. Cobalt silicate possesses a rich blue color and is used extensively in the china trade. In enamels, cobalt is used to neutralize the yellow tinge due to iron oxide.

The salts of cobalt which are at our disposal in commercial quantities are all of the cobaltous or divalent type. It has been found that although they can be readily used in the manufacture of driers, and worked like the various compounds of manganese, lead, zinc, calcium, aluminum, etc., the organic compounds formed, which are the basis of the so-called driers, are not efficient while in the cobaltous state. The formation of trivalent cobalt compounds is sought in the making of driers. The value of cobalt compounds depends not on their power to dry linseed oil, but on their ability to make the lower priced semi-drying oils act like linseed oil.

In conclusion it may be added that unless some extensive cobalt deposits are found, the source of cobalt is limited. The cobalt content of the present ores is gradually decreasing and the impurities are increasing, which has a tendency to raise the cost of production. The superiority of cobalt and its compounds in the stellite, magnet steel, ceramic, paint and varnish industries has been established. The properties of cobalt and its compounds are remarkable, varying from imparting great hardness and strength in stellite, high magnetic retentivity in permanent magnets, beautiful blue color in china and enamels, to its action as a catalytic agent in the oxidation or hydrogenation of oils. The demand for cobalt or its compounds is becoming greater, but its use will, no doubt, be confined to those industries in which the price of the raw material is small in comparison with the results achieved or savings effected.—Editor's Note—*In a preface to the original paper the author pointed out that only the essential points dealing with the production and uses of cobalt were reviewed in the paper. For detailed information concerning occurrences, metallurgy, uses, and alloys, the reader is referred by the author to the Report of the Ontario Department of Mines, XXVII, Part 3, 1918.*

February 24th, 1923.

2. E. W. Westcott, U. S. Patent No. 1406595.
3. Honda and Seite, K. S. Magnet Steel, Electrician, 85, 705, (1920); Steels for Permanent Magnets, Electrician, 86, 327, (1921); Kayser, Electrician, 88, 421 (1922)

BOOK REVIEW

"Patents and Chemical Research"

By Harold E. Potts, University Press of Liverpool, 195 pp. $2.25

Directors of research laboratories and individual research chemists have long recognized the difficult set of problems which arise when matters of a chemical nature are placed in the hands of the systems created by law to protect inventors and deal fairly with the public. This book covers the situation as it exists in England at the present time, and is written by one who has had a wealth of experience. Chemists, who have not had first-hand experience in the business of securing and handling patent rights, cannot well valuate the vast number of possibilities that arise, which may lead to loss, litigations and dissatisfaction, or may result in profirable or satisfactory business transactions, even where undoubted novelty has been proved, and industrial application is self-evident.

The chemical industry is extremely prolific in patentable inventions. The education of the average chemist has been entirely neglected in this respect. The situation thus created gives such a work a high degree of usefulness. The fundamental principles behind the patent system are considered in detail, and by the use of chemical cases the whole work becomes a most valuable treatise for the layman chemist.

Production of Power Alcohol in the British Empire

THE Fuel Research Board of Great Britain has issued a second memorandum dealing with the possibilities for the production of power alcohol in the Dominions—first in order to meet their own requirements for liquid fuels, and, secondly, for export to the United Kingdom or other portions of the Empire. It is evident that there is small prospect of the United Kingdom itself increasing its own supply of liquid fuel by production of alcohol from home-grown materials. The general conclusions arrived at by the Department of Scientific and Industrial Research regarding production in the Dominions and colonies are as follows:—

Canada

Next to the United Kingdom, Canada is the greatest consumer of liquid fuel in the Empire, but produces only a very small proportion herself. Industrial alcohol is manufactured from damaged grain and from home and imported molasses—about 600,000 to 700,000 gallons a year being produced. If the waste sulphite from paper and pulp mills were utilized, the alcohol from this source would not amount to more than five million gallons a year. Waste wood and sawdust exist in enormous quantities and it is estimated that an average of 10,000 tons are destroyed daily in British Columbia alone. If this were treated it would yield forty to fifty million gallons of alcohol annually. While processes exist for producing alcohol from wood waste and while they were worked on a large scale during the war, they can, the Department states, hardly be said to be commercially successful as yet.

Australia and New Zealand

The liquid fuel requirements of Australia are large, and are increasing annually, nearly twenty-five million gallons being consumed in 1920. Some of the suggestions made for the production of alcohol are: By using the molasses from sugar refining in Queensland and New South Wales, which would produce, however, only a maximum of about three and one-half million gallons; by the cultivation of certain plants containing either sugar or starch; by utilizing the enormous deposits of brown coal to produce electrical power for the manufacture of calcium carbide, from which alcohol by catalytic processes can be made.

South Africa

It is estimated that about two and one-quarter million gallons of alcohol could be made from molasses from sugar refining. A certain proportion is already being made and used for internal combustion engines in the form of Natalite, a mixture of alcohol and ether, but the one and one-quarter million gallons produced in 1920 was far short of the Union's liquid fuel requirements. The sweet potato is recommended for alcohol production, but it would have to be more intensively cultivated than at present; were this done an output of some six to seven tons per acre should be possible, yielding thirty-five gallons of alcohol per ton, or from 200 to 250 gallons per acre. Another crop recommended is the cassava, giving an even higher yield of alcohol per acre. The discovery of a cheap and simple process for treating the numerous grasses, maize stalks and waste straw, together with low harvesting, collection and transport, would open the way to another source of power alcohol.

The same conditions will apply more or less to the other African dominions. In Northern Rhodesia, considerable grain crops could be utilized, and a comprehensive scheme worked out whereby the planters would find the growing of grains for alcohol a profitable undertaking. There is plenty of cheap labor and plenty of material could be produced in excess of food requirements. In the Kenya Colony and the Protectorates of Nyassaland and Uganda there is suitable land for the growing of maize, serghum grain, sweet potato and cassava. Cassava and rice are grown mainly in Sierra Leone, but yields are poor. Motor fuel is increasing in demand, and scientific growing and harvesting of such crops as maize, sweet potatoes and cassava would appear desirable for its production.

Island Colonies

None of the island colonies seem to be in a favorable position to produce very much power alcohol from crops, as these are mostly grown for food either for home or export. In Ceylon a committee appointed by the government has recommended the cultivation of sugar cane to supply Ceylon's requirements of refined sugar, but even if this were done the resulting molasses would only produce about 600,000 gallons of alcohol, whereas imports of gasoline in 1919 amounted to 1,175,784 gallons.

Conclusions

It will have been gathered from the preceding paragraphs that the production within the Empire of alcohol from materials containing sugar or starch is only likely to be commercially possible in the near future in some of the Dominions and Colonies, and then only on a scale to meet local requirements. Production on these lines is receiving attention in several directions, and in this connection the Fuel Research Board of Great Britain is in constant touch with the Dominions and Colonies. When the cost of growing the raw materials, or collecting them where they occur naturally, as well as the costs of the production and transport of the finished article approach more nearly pre war figures, it may become possible to produce alcohol in excess of local requirements in those portions of the Empire where soil and climate are suitable. This, however, can only be the case where labor is available after meeting the demands for it for the cultivation of food for local consumption and for the staple industries of the country. The possibility of obtaining power alcohol from waste starchy materials must also be borne in mind. Thus, the straw from which grain has been threshed frequently contains an appreciable quantity of starch in the residue of the grain and in the straw itself. A combined paper-pulp and alcohol industry using raw materials of this nature may be found practicable where such waste is abundant, and transport and labor are cheap.

RESTRICTIONS ON INSULIN

The Medical Research Council of Great Britain, in a further statement on Insulin and the treatment of diabetes, indicate that British Drug Houses, Ltd., in conjunction with Messrs. Allen and Hanburys, and Messrs. Burroughs, Wellcome, and Co., are now making insulin under supervision by the Medical Council.

Owing to the shortage at present of present supplies, the Council are imposing certain restrictions upon the use of insulin by hospitals and practitioners:—

1. Careful correlation will be made of the diet, of the blood-sugar changes, and of the insulin dosage in each case. For at least one group of cases it is known already that the insulin losage can be reduced progressively with suitable adjustment of diet. This reduction allows economy of insulin, besides the advantage it may bring to the patient.

2. Insulin will not be given to those whose symptoms can be controlled by moderate restrictions of diet. There should be no luxury use of insulin until supplies are abundant.

3. It is understood, of course, that in emergency, and apart from the careful correlation just mentioned, insulin will be given to those in diabetic coma, or those nearly approaching it, and it may be given to those with diabetic symptoms needing special preparation for some surgical operation.

4. Care will be taken to avoid the danger of giving insulin to non-diabetic cases (*e.g.*, to patients with renal glycosuria).

—*The Chemical Age* (London.)

Industrial Uses of Hydrogenated Oils

By W. W. Myddleton, D.Sc., *Department of Chemistry, Birkbeck College, London*

Many industries find the solid fats of greater value than the liquid glycerides. For these industries there has been opened up within recent years a vast supply of raw material in the form of synthetic fats prepared in a simple manner from the liquid oils. The process of hydrogenation is effected by stirring the oil with a small amount of a finely divided catalyst containing nickel, while hydrogen is passed through under carefully regulated conditions of temperature and pressure.

Such unpromising material as the fish oils with their characteristic odor and taste can be converted by hydrogenation into almost odorless and tasteless white products, varying in consistency, according to the duration of the treatment, from that of lard to that of the completely saturated hard tallow melting at a temperature as high as 70° C. The synthetic fats have found important application in the preparation of edible products such as chocolate fats and margarine, in the manufacture of soap and candles, in tannery practice and dressing of patent leather.[1] Hardened castor oil is used as an insulating material for electrical purposes,[2] and treated cotton-seed oil is said to impart a matte finish to paint compositions.[3]

It must not be supposed that the utilization of these fats in the various industries is as straightforward as in the case of the natural tallows. The fact is that the artificial tallows differ from the natural article in chemical composition, and if we are to understand the problems arising in the attempt to replace the natural by the artificial we must find out exactly wherein the difference lies. To demonstrate this point a sample of cotton-seed oil whose iodine value was 102.9 was saponified. The fatty acids were isolated and separated into solid and liquid components by the lead-ether method described by Lewkowitsch. The solid portion, representing twenty-five per cent. of the mixed acids, was identified as palmitic acid. The liquid portion consists of oleic and linolic acids in quantity representing approximately thirty-one per cent. and forty-four per cent. respectively of the total mixed acids. A quantity of the oil was hydrogenated in the presence of a nickel catalyst at a temperature of 180° C. until the iodine value was reduced to 51.9.

Assuming for the moment that during hydrogenation the combined linolic acid is first converted into oleic acid and that stearic acid then appears, an assumption that is approximately true,[4] we arrive at the conclusion that the mixed acids obtained by saponifying the hydrogenated oil should contain forty per cent. solid acids, the fall in iodine value accounting for the conversion of the whole of the linolic acid into oleic, and thereafter the production of fifteen per cent. stearic acid. When the mixed acids were separated as before, the solid portion was found to form sixty-five per cent. of the whole.

A considerable amount of hardening had been effected therefore without absorption of hydrogen. It follows that the solid acids after hydrogenation must contain a new type of acid—solid but still unsaturated—and should exhibit a considerable iodine value. The iodine absorption was actually 33.8 per cent. This figure at once distinguishes the hardened product from the natural tallow. C. W. Moore[5] has effected the isolation of the new acids of hydrogenation from a partially hydrogenated ethyl oleate, and has shown them to consist of a mixture of elaidic with a new acid isomeric with oleic acid, having the double bond in a different position along the carbon chain. It must be noted that the new acids of hydrogenation vary in character according to the nature of the oil used; they may, for instance, be isomeric with palmitoleic or with erucic acid if these acids are present or are produced in the oil during hydrogenation. The origin of the acids does not at the moment concern us, so that we may consider their special properties, and the modification they bring about in the properties of the synthetic tallows. It is the practice to interrupt the process of hydrogenation before it runs to completion, since the later stages are somewhat slow, so that the new acids of hydrogenation escape complete hydrogenation and invariably occur in the commercial product.

The fish oils commonly contain moderate amounts of unsaturated acids possessing twenty or more carbon atoms in the molecule. After partial hydrogenation of these oils the new solid unsaturated acids are accompanied by behenic and higher members of the saturated series. This type of fat therefore differs widely from the natural tallow.

Food Value of the Synthetic Fats

The average human being requires a daily ration of food which will supply about 3,300 calories of heat energy, and of this, nearly one-third is normally contributed by fats. The digestibility of synthetic fats is, therefore, of great importance. The digestibility of a natural fat is fairly well indicated by its melting point; hard fats melting above 50° C. are absorbed to the extent of about ten per cent., whereas soft ones, such as lard, have the maximum digestibility of about ninety-seven per cent. Authorities generally regard a melting point of 43° C. as a maximum limit for a good edible fat.

This applies also to mixtures, so that if a hard fat is incorporated with a soft one to produce a composition of average melting point, digestion proceeds satisfactorily.

It has been shown that the natural fats commonly employed in margarine manufacture are satisfactorily absorbed.[6] A feeding experiment carried out in Germany on 250 people under medical observation showed that a diet containing twenty-three per cent. hydrogenated whale oil was normally assimilated and no deleterious effects were noted.[7]

Presence of Nickel

The effect of nickel upon the human organism has been studied closely. It has been shown that nickel taken in small amount is almost completely excreted, and that as much as 0.5 grammes per day (in terms of oxide) can be taken without ill effect.[8] The hardened fats have a maximum reported nickel content of six milligrammes per kilogramme, and in fact most modern products contain no detectable amount of the catalyst. Food cooked in nickel vessels has been reported to contain from sixteen to 107 milligrammes of nickel per kilo.[9]

Ability to Replace Natural Fats

In spite of what has been said, the synthetic fats cannot completely replace the natural products. The question of the mechanism of nutrition has acquired a new interest in the discovery that in addition to a sufficient supply of food for the material renovation of the organism and the supply of energy, certain substances provisionally described as vitamins are essential if the body is to utilize efficiently the food supplied. These exist in minute amount in animal fats and oils (with the apparent exception of lard) but are apparently destroyed during hydrogenation. They are not present in the vegetable oils and fats.[10]

In the present state of our knowledge it is not possible to determine the minimum vitamin content of a fat which is to be regarded as a complete substitute for a vitamin-containing animal fat. It does not seem essential to insist that vitamins shall be present at all, since a sufficiency can apparently be obtained in other items in the normal diet.

In the light of the discovery of Miura and Zilva[11] that cod liver oil shows a vitamin activity from forty to 230 times greater than butter fat, it would seem that the incorporation of small amounts of such a substance would remove the last reproach from the synthetic fat as a staple food.

Chocolate Fats

As far as physical properties are concerned cocoa butter is ideally suited for use as a chocolate fat; it melts at a temperature of about 33° C. and can be cast into any desired shape to form a hard, homogeneous, but not too brittle mass. It is, however, expensive; and its digestive properties leave much to be desired.[6]

As a complete substitute for cocoa butter the synthetic fats have the drawback of setting to a heterogeneous mass, and unless the melting point is rather high they do not cast well. The heterogeneous setting may be inhibited by the addition of the requisite amount of a natural fat containing the glycerides of myristic or palmitic acid in fair quantity. Cocoa butter itself may be used for the dilution since it contains approximately nineteen per cent. palmitin. Other diluents of the same type suggest themselves, but whatever the added substance may be, it must be remembered that the melting point of the mixture is not the mean of those of the separate fats. It is probable that the addition of hydrogenated maize oil would improve the casting properties since this substance expands considerably on setting.[12] It may be found advantageous to convert a portion of the hydrogenated glycerides into di-glycerides by suitable treatment with glycerine[13] although again the possible influence upon the melting point must not be overlooked.

Margarine

The influence of the new acids of hydrogenation, and of the higher saturated acids in the hardened fish oils is commonly revealed in the spotted appearance of the emulsified product, and in the separation of hard granules during its use for cooking purposes. The remedies suggested in the case of chocolate fats would also apply here.

Brauer asserts[14] that margarine containing synthetic fats tends to retain excessive amounts of moisture, and if this is the case (it is disputed by some workers) the fault is probably due to a heterogeneous setting which might be modified as suggested above.

Candles

It has been pointed out[15] that even in candles prepared from natural tallow acids it is necessary to preserve a balance between the amounts of stearic acid and palmitic acid in the mixture. If this adjustment is not made a coarse crystalline structure is the result, and the finished candle lacks transparency and ring, and is inclined to crack and break. These faults have been remarked in the case of candles prepared from synthetic tallow acids[16] and they are, if anything, more pronounced. It is obvious that if the mixed acids derived from a hardened oil crystallize in a coarse form it will be impossible to express the oleine freely, and a low melting product will be the result. The admixture with palmitic acid before seeding for expression thus serves the double purpose.

Soap

The detergent action of a soap is closely related to its power of forming stable emulsions with the greasy matter accompanying dirt, and with its power of forming a lather or foam, which may be regarded as an emulsion between the soap solution and air. Both of these properties are in turn related to the surface tension of the solution and to the superficial viscosity of the surface layer in which the soap is concentrated according to the well-known rule of Willard Gibbs. In true emulsion formation the part played by surface viscosity is considerable, but in foam formation it is of minor importance. The amount by which a soap lowers the surface tension of the water in which it is dissolved is an excellent criterion of its detergent power.

The sodium soaps of the liquid fatty acids, oleic, linolic and linolenic, produce the maximum lowering of surface tension, and with these may be classed the soaps of the nut oil fatty acids.

The new acids of hydrogenation must be classed with palmitic and the higher saturated fatty acids since they have a surface tension effect much less than that of the liquid acids. With respect to surface viscosity, too, the new acids are akin to the palmitic type, producing solutions with highly viscous surface layers, but as against this presumably good feature, we have developed the tendency to produce insoluble acid soaps by hydrolysis and the solubility of the soap itself is diminished. We see the influence of the deleterious acids produced during hydrogenation reflected in the properties of the soaps made from the synthetic fats.

The technical literature is full of complaints,[17] but it must be said that the hydrogenated products are not without their champions.[18] The consensus of opinion is that as a complete substitute for the natural fats the artificial products are not satisfactory. The soaps they yield:—

1. Are less soluble than those of the natural tallows;
2. Readily form insoluble acid soaps by hydrolysis;
3. Are poor in surface tension action;
4. Do not lather freely, and have poor detergent action;
5. Possess a characteristic odor incompatible with many perfumes.[17]

The remedies suggesting themselves are numerous. It seems impossible to remove the new acids of hydrogenation when once formed, and if it were possible to prevent them from appearing we should still have to deal with the saturated acids of high molecular weight in hardened fish oils. The most hopeful method of masking the action of the deleterious constituents is to add a carefully chosen acid or mixture of acids to the hydrogenated product so as to form an "eutectic surface tension mixture."

The lowering of surface tension produced by a mixture of soaps is not generally the mean of the lowering effected by the separate soaps; it is often much greater. It is in many cases possible to enhance the action of soaps made from artificial tallows by adding moderate amounts of other soaps derived from liquid acids or from nut oil acids. In all cases, even when natural fats are employed, it is important to preserve a balance between the amounts of liquid and solid acids in the soap mixture For the best all-round results the ratio is approximately 50 : 50. The new acids of hydrogenation rank, of course, as solid acids and cannot function as their liquid isomers of identical iodine value.

Sufficient has been said to make it abundantly evident that before the synthetic fats become firmly established as complete substitutes for the natural tallows, greater consideration must be paid to the composition of the synthetic product. A thorough analysis of the fats must be made part of the laboratory routine, since the amount of the deleterious acids produced during hydrogenation is not constant for a given reduction in iodine value, even when the raw material is the same.—*The Chemical Age*, London.

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The Synthesis of Ammonia by the Fauser Process

OWING to the importance of nitrogen compounds to agriculture and in the manufacture of explosives all new processes which are proved practical are worth investigating. The Haber and Claude processes are probably the best known for the synthesis of ammonia. The Casale process has recently come to the front and we have described it at some length (see CANADIAN CHEMISTRY AND METALLURGY vii., p. 12, Jan., 1923). In the April number of the *Giornale di Chimica Industriale ed applicata* A Zambianchi gives an interesting description (translated in *La Revue des Produits Chimiques*, xxvi, 401-404, June 30, 1923) of the synthetic ammonia and nitric acid plant of the Societâ Elettrochimica Novarese at Novarro. One of the most interesting features of the process, from a Canadian viewpoint, is that it is an electro-chemical process which requires merely air, water, and electric power.

The following is an abridged translation of the article in *La Revue des Produits Chimiques*:—

The plant consists of three parts: the hydrogen-generating equipment, the ammonia synthesizer, and equipment for oxidizing the ammonia to nitric acid.

Preparation of the Hydrogen

In Italy the electrolytic production of hydrogen has the twofold advantage of freeing the country from the very expensive importation of coal and of giving a very pure product which obviates the necessity of the complicated and expensive purifying plants used in Germany and at the same time ensures long life for the catalyzer.

On the other hand there is the fact that electrolytic plants are expensive to install, and there is always the danger of explosion through accidental mixing of the two gases.

In order to eliminate this danger as completely as possible, Fauser uses a two-diaphragm cell having a narrow space between the two diaphragms. The gases generated by electrolysis are collected in lateral chambers and drawn off by suitable conduits. Should one of the diaphragms be damaged, or should the level of the liquid fall below the top of one of the diaphragms, the gas escapes into the central space between the diaphragms and is led directly outside. It is readily seen that such an arrangement gives a much purer gas than the ordinary type of diaphragm cells.

In the Fauser cells the electrodes consist of series of iron rings placed horizontally in such a manner as to facilitate the escape of the bubbles of gas towards the centre, and an exterior envelope asbestos fabric prevents the diffusion of the gases outwards. In order to avoid an excessive concentration of the gases, without having to unduly reduce the height of the electrodes, suitable bells are provided at intervals in the chambers to collect the gases and send them directly to the respective conduits, which are connected directly to the electrodes. The external faces of the bells are covered with a suitable alkali resistant insulator to prevent them from taking any part in the electrolysis. The inner walls of the cell act as negative electrodes and are also provided with suitable gas-collecting bells.

The hydrogen and oxygen from the cells are sent to respective separators where the entrained electrolyte is removed and returned to the cells while the gases are metered and sent to suitable tanks.

The cells at the Navarro plant have the following dimensions: height 2.25 meters, width 0.65 meter, length 1.30 meters. The total weight of each unit is about 800 kilos. Each cell rests on six porcelain insulators which are fixed on a cement foundation.

The electrolytic plant consists of four batteries of twenty cells each. Each of these batteries is independent of the others, so that any one of them can be cut out for repairs without interfering in any way with the operation of the others. The whole plant is fed by means of three six-phase 1,500-k.w. commutators which transform 150-volt three-phase current into 210-volt direct current. The cells absorb 6,000 amperes at 2.4 volts, corresponding to a consumption of 6 k.w. hr. per cubic meter of hydrogen produced. By slightly increasing the voltage, the cells can be made to absorb 8,000 amperes. When working to capacity the production is 6,000 cubic meters of hydrogen per day. The purity of the gas is over 99 per cent. A special device is provided for automatically indicating the purity of the gas and for cutting off the current as soon as an explosive mixture is formed.

Synthesis of Ammonia

The ammonia synthesis apparatus consists essentially of: (1) a special high pressure compressor for compressing the gases and a certain amount of water, the function of which will be explained a little further on; (2) a column for carrying out the synthesis, including the reaction chamber; (3) a column for the absorption and for the separation of the ammonia formed; (4) a pump for circulating the compressed gases in the apparatus; (5) an apparatus for distilling the ammonia water by means of the heat of the gases from the reaction chamber.

The plant operates as follows:—

The compressor draws in on the suction side a mixture of nitrogen and of hydrogen, together with a certain amount of water which fills the twofold function of lubricating the compressor and of absorbing the ammonia formed in the reaction chamber which has not been previously separated. The mixed gases and water vapor is sent to a column where it meets the gases already in the cycle. Here the water absorbs the ammonia in the latter gases and separates from the gases, being collected and drawn off at the bottom of the column. The gases then go through the circulation pump and are sent to the synthesis column, which consists of three parts: a separating chamber at the bottom where the last traces of water are removed, a heat exchanger for heating the gases, and the reaction chamber proper, which contains the catalyzer and a thermoelectric spiral to raise the temperature to the point required for the reaction. Once the reaction has set in, the heat generated is sufficient to keep the temperature up, and a thermoelectric couple is provided to regulate the temperature. After passing through the catalysing chamber the gases, which have partly combined to form ammonia, go through the heat exchanger where they heat up the incoming gases and have their temperature reduced to 100°C. They are then used as a source of heat in a fractionating column in which the ammonia is driven off from the ammonia water formed in the above-mentioned absorption column.

On leaving the worm of the fractionating column the gases are cooled down still further and a large portion of the ammonia separates out as an anhydrous liquid which is drawn off and stored either in a gas tank or in steel bottles under pressure. Finally, the compressed gases which still contain a considerable amount of ammonia are sent to the absorption column. As mentioned above, this column is used for separating the water which has acted as lubricant for the compressor; and the water as it descends through the column meets the ascending gases and absorbs all the ammonia. The uncombined gases are then drawn in by the circulation pump and go through the same cycle over again.

The ammonia water is drawn off at the bottom of the column and the ammonia is driven off using for the purpose the gases at 100° C. from the heat exchanger of the synthesis column and also the heat of the water deprived of its ammonia.

The plant at Novarro has a daily capacity of 1,800 pounds. It consists of two compressors (one only operating at a time, the other being in case of emergency) which compress 250 cubic meters of gas an hour to a pressure of 300 atmospheres. The compressors are run by a 140 h.p. electric motor. The synthesis

column is eight meters high and has an internal diameter of 350 mm. Numerous automatic devices are provided for regulating and controlling operations, thanks to which the whole plant, including the electrolytic apparatus, can be attended to by four men.

Oxidation of Ammonia and Production of Nitrogen

The ammonia is oxidized to nitric acid by the Frank and Caro process, which is extensively used in Germany and for which the company are the sole licensees for Italy.

The oxidizers consist of four burners, 600 mm. in diameter, provided with platinum wire gauzes, and capable of oxidizing 400 kilos of ammonia daily, equivalent to a production of 10 tons of 36° Bé. nitric acid. The nitrogen oxides are absorbed in three ferrosilicon towers and four iron towers ten meters high and 1.50 meters in diameter.

Fauser had the happy thought of obtaining his nitrogen for the synthesis of ammonia from the residual gases which come from the oxidizers and absorption towers, thus avoiding the complicated and expensive plant which would be required to produce nitrogen by the liquefaction of air. The gas from the last absorption tower contains a very high proportion of nitrogen (97-98%) and a small amount of oxygen. The method used for removing the latter is extremely simple: it consists in mixing the gas with a calculated amount of hydrogen and passing it over platinized asbestos. The oxygen and hydrogen react to form water and there remains nothing but nitrogen. By increasing the amount of hydrogen added, the mixture required for synthesis, namely N_2+3H_2, can be obtained directly. This process has the further advantage of recovering completely any traces of nitrogen oxides which might have escaped absorption. By preventing a rise in the temperature of the catalyzer the nitrogen oxides are reduced to ammonia which condenses as an aqueous solution.

Power Consumption

According to Fauser's calculations the power consumption for the fixation of 1 kilo of nitrogen as ammonia is about 17 kw. hours. Assuming a 90% conversion, fixation as nitric acid will require about 19 kw. hours. This refers to direct current such as it is used for electrolysis. In calculating the power consumption as alternating current, the losses incurred in rectifying the current must be taken into consideration.

SALT PRODUCTION OF CANADA, 1922.

The Dominion Bureau of Statistics issues the following finally revised statistics on the production of salt in Canada during 1922.

The output of salt from all sources in Canada during 1922 totalled 183,438 tons, of which quantity approximately 99 per cent. or 181,794 tons valued at $1,628,323 was marketed. Compared with the sales for the previous year, the 1922 records showed an increase of 10,811 tons or 6.6 per cent. in quantity and a decrease of $45,362 or 2.7 per cent. in value.

Ontario continued to be the chief producer contributing 97.2 per cent. of the total sales. Nova Scotia shipments, from the Melagash mine, amounted to 5,053 tons of common coarse, land and rock salt.

PRODUCTION OF SALT IN CANADA, 1922.

GRADE	Quantity Made (Tons)	Quantity Sold (Tons)	Value of salt sold (not including p'kges) $	Stocks on hand at end of year (Tons
Table and dairy	41,274	41,119	837,994	681
Common fine	35,758	34,684	329,475	6,853
Common coarse	28,096	28,580	282,336	3,703
Land salt	6,964	6,875	38,840	184
Other grades	7,636	6,826	72,621	547
Brine for chemical works (Salt content)	63,710	63,710	67,058	...
TOTAL	183,438	181,794	1,628,324	11,968

Chemistry and Volcanic Activity*

By Prof. John Bright Ferguson

A QUAINT medal struck in honor of Leonello about 1500 A.D. represents Vesuvius in action. The volcanic cloud, the bombs and the lava stream so curiously depicted by the artist, all bear witness to the fact that even at that time the essential characteristics of volcanic action were well known. In later drawings (1783), observers are found, perched in perilous positions, minutely examining crater activity. The science of Volcanology, therefore, can hardly be looked upon as one of recent origin. Despite this fact, Chemistry's contribution to this science has but recently assumed its proper place.

Modern field investigations by men like Day, Shepherd or Jaggar—to mention but a few—have resulted in the collection of excellent samples of volcanic gases and lavas and the acquiring of many temperature records.

At Kilauea on the island of Hawaii, the composition of the volcanic gases have been found to vary and indeed probably do vary from bubble to bubble as the great bubbles break at the surface of the red hot lava lake. These gases contain much water vapor together with such gases as nitrogen, chlorine, fluorine, carbon dioxide, carbon monoxide, sulphur dioxide, sulphur trioxide and hydrogen. There is little doubt but that these gases are a real source of heat to the lava lake. At present, it is a mooted question as to whether the greater source of heat lies in the oxidation of the gases by air or whether it lies in the gas reactions brought about by the shifting of the equilibrium conditions by pressure.

Much geological opinion was inclined toward the view that such gases as water vapor, nitrogen, chlorine and fluorine were of meteoric origin since an abundant supply of these may be found in the sea and the air. Analytical studies of the gases show that the proportions in which these gases occur are not in accord with such an hypothesis. The simplest explanation is that they too are plutonic in origin to a large extent.

The lava at Kilauea is too complicated a chemical system to warrant a direct chemical study of it, other than an analysis. The Geophysical Laboratory of the Carnegie Institution of Washington has for many years been engaged upon the study of the simpler systems leading up to a consideration of the more complex ones like a magma. Some of the observations there made throw considerable light upon many obscure phenomena.

Partially melted crystals are sometimes found in rocks, and the petrographer finds that the obvious explanation that the rock was first cooled and then re-heated cannot be reconciled with general condition of the rock in all cases. A glance at the results of the work upon the simpler systems suffices to show that the crystallization of a phase and later resorption with a continuously falling temperature is by no means uncommon in such systems.

Evidence has been obtained from several sources that lava may become explosive some time *after* it has emerged from the earth. The study of systems involving a volatile component shows that pressure may be developed in a melt as a result of gas being liberated when the melt cools. This may be brought about by partial crystallization or be in the nature of a second boiling, a phenomenon well known to students of the Phase Rule.

If we accept the thesis, that the centre of the earth is not very hot and there is much support for this view, the energy which is dissipated in volcanic activity must arise from the chemical readjustment of the magma. Pressure changes perhaps induce these to take place. There may be other factors but there can be no doubt that the volcanologist of today, guided by the principles of Chemistry, is in a fair way to solve many of the solvable questions of the science of Volcanology.

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*A partial account of an address given at the joint meeting of the Canadian Institute of Chemistry and the Society of Chemical Industry, held in Toronto on the evening of May 4th, 1923.

Colloidal Chemistry of Paper Sizing*

The chemical equilibrium which exists in the beater involves wide-reaching hydrolyses both of the sodium resinate and the aluminum sulphate which are used in the sizing process, the latter as such and the former in the state of rosin size or rosin milk. The degree to which these two substances are hydrolyzed is influenced to a large degree by the salts that are found in the water used in the factory and also by the proportion of free rosin in the rosin size. The hydrolysis of the aluminum sulphate, which results in the liberation of free sulphuric acid, neutralizes the peptizing action of the sodium hydroxide which is liberated due to the hydrolysis of the sodium resinate.

In the study made by the authors of this article, who are Wolfgang Ostwald and R. Lorenz, the flocculating action of various electrolytes on abietic acid, that is resinic acid or free rosin in the state of hydrosol, a colloidal solution in the solution state in a water medium, has been investigated very thoroughly from a quantitative standpoint. It was found that this action was more powerful, the greater the charge of the cathion, while the peptizing influence increases with the charge on the anion. Thus molecular quantities of aluminum, magnesium and potash in the form of chlorides, which were required to effect incipient flocculation of the hydrosol, were in proportion of one to 1,700 to 5,000. On the other hand, when the sulphates of these metals were used in the experiments, the ratios were one to fifty to 150.

Calcium salts in the beater water have a strong fluctuating effect on the resinic acid hydrosol. Sodium salts also have such an influence but, while it is less than that of the calcium salts, it is not inconsiderable. Carbon dioxide was found to have a weak flocculating effect.

There are certain substances which may be added to commercial sizes and which act as protective colloids. They preserve the dispersion of the rosin particles. One such substance is the aqueous extract of casein. This is a powerful protective agent, but an alkaline solution of casein itself is flocculated by aluminum sulphate. So there is no end gained in adding this substance to the rosin size. When the casein is flocculated the articles of abietic acid are carried down with it by oclusion. Another substance which delays flocculation to some extent is potato starch paste. Small proportions of gelatine have a very powerful stabilizing action.

These stabilizing colloids act in the same manner as mordants. They preserve the dispersion and constitute a bridge between the cellulose and the rosin.

Experiments by electrophoresis showed that pure paper pulp in water migrates to the anode, and consequently the pulp in the beater carries a negative charge. If the paper is ground up with a strong solution of aluminum sulphate, the pulp then migrates to the cathode.

Colloidal aluminum hydroxide solution carries a positive charge. Colloidal resinic acid carries a negative charge, and behaves in exactly the same way as pure paper pulp. Thus the fibre and the colloidal rosin are two similarly charged colloids, and hence they have a repellant action on each other. It is therefore clear why it is impossible to make a permanently sized paper by precipitating the size with acids alone. Without the positive charge of the aluminium hydroxide the union between the paper fibre and the rosin is due only to mechanical and capillary actions.

If too large an excess of sulphate of alumina be used the charge of the whole system becomes positive and the quality of the sizing is impaired, because the positively charged components repel each other. Thus, according to the electrostatic theory of sizing, a firm, permanent sizing is only obtained when the condition is isoelectric, that is, when the positive charge of the aluminum hydroxide fixed in the pulp balances the negative charges of the paper and the abietic acid.

The effect can be demonstrated in a series of graduated cylinders which contain paper pulp and to which there is added a constant quantity of abietic acid hydrosol. The volume of sediment is constant after a number of hours. If increasing quantities of a mixture of sulphate of alumina and colloidal aluminum hydroxide solution be added to the pulp in cylinders the volume of the sediment decreases in regular order to a minimum and then increases again. This is due to the repulsion of components of the negatively and positively charged systems, the maximum compactness corresponding to the isoelectric mixture.—Abstracted from *Kolloid Zeitschrift* through *Paper* (New York).

*An abstract of article appearing in "Kolloid Zeitschrift," volume 32, (1923), page 195-209. The article is regarded as an important one by paper chemists who have read it.

TANTALUM AND ITS PRACTICAL USES

By S. L. Malowan

Metallic Tantalum was first prepared by Berzelius, in 1824, by heating sodium tantalum fluoride with potassium.

Moissan, in 1902, prepared tantalum from tantalic acid, by reduction with carbon in an electric furnace. The product contained about 0.5% carbon.

Werner von Bolton, in 1903, prepared a pure and easily-worked metal in the lamp works of Stimens and Halske.

The most important ore of tantalum is tantalite, found in Sweden, Finland, Australia and Spain.

The Australian ore contains 50% to 70% oxide of tantalum.

The raw material from which the metal is made is tantalic acid, which undergoes many changes and, after reduction of potassium tantalum fluoride $K_2 F_2 T_5$, the resulting dark gray powder is melted in an electric vacuum furnace to a compact mass. The melting point of tantalum thus prepared is said to be 2250° C., but is probably higher. Tantalum is very ductile and tough. Pure tantalum is not so hard as the metal with a small addition of oxide. Metallic tantalum is extremely difficult to attack chemically, and is unaffected by alkalis and acids, with the exception of hydrofluoric acid.

Tantalum wire of smallest diameter is used in electric lamps. A tantalum lamp burns with an efficiency of 1.5 watts per Hefner candle, with a life of 1000 hours. At two watts per Hefner candle, the temperature of the wire is 2201° C. Recently, tantalum has been used for making tools, and the claim is made that such tools are very hard.

Unfortunately, tantalum can never be used to completely displace platinum, as it is not nearly so inactive toward oxygen.

In steels, tantalum raises the breaking and elasticity limits. —From *Edel-Erden und Erze, Bd. 4, S. 26.*

A NEW ETHYLATING AGENT

For some time past Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa., in connection with the work of the Multiple Industrial Fellowship sustained by the Carbide and Carbon Chemicals Corporation, 30 E. 42nd Street, New York. N.Y., has been making a thorough investigation of the properties and uses of diethyl sulphate as a general ethylating agent. Mr. A. R. Cade, an Industrial Fellow of the Institute, has published recently a report of the findings of this investigation, which report shows diethyl sulphate to be a most satisfactory general reagent for introducing ethyl groups into organic compounds. Mellon Institute will be pleased to furnish samples of this material to anyone interested, and Mr. Cade will correspond gladly with anyone who desires further information upon this subject. Reprints of the article referred to above may be obtained by writing to Mr. Cade at the Institute.

SOME FACTS ABOUT PLATINUM

The United States Bureau of Mines has concluded an exhaustive study on the subject of platinum, with the principal object of determining whether the United States really has any important domestic sources of platinum. According to a recent report by the Bureau "Platinum Assays and Platinum Promotions", there appears to be no important resources in the United States—at least none which is at all likely ever to supply the demand, or any considerable portion of it. The available domestic supply is under 1,000 ounces a year, which is not very much when the United States needs 10 to 15 times that quantity.

The Bureau warns the public and the mining industry as to mistaken or fradulent platinum returns or promotions. That there is some platinum in the United States is undisputed. The official returns of the Geological Survey show that in 1922, 929 ounces were produced, the highest on record. But, virtually, all this metal was recovered from the heavy concentrate or the well-known black sand collected on dredges or at hydraulicing plants in California, Oregon and Alaska. As the dredges alone handle over 50,000,000 cubic yards of gravel per year, the platinum content per yard is infinitesimal. Comparing the American output with the normal of 300,000 ounces per year from Russia and the present 30,000 ounces from Columbia, the former appears insignificant.

In addition to the pacific coast states mentioned, and the well-known lode deposits of the Rambler mine in Wyoming; the Boss mine in Nevada; and the Salt Chuck mine in Prince of Wales Island, Alaska, which also contain platinum metals but always in combination with copper and some gold and silver; Boulder County, Colorado, and Copper King mining district, Nevada, have supplied samples in which the Bureau chemists detected small quantities of lode platinum.

Russia is the greatest producer of platinum, supplying 90 per cent. of the world's total. Both in Russia and Columbia, South America, the platinum is all recovered by dredging or hand-washing methods.

In Canada the production of metals of the platinum group (platinum, palladium, rhodium, osmium, ruthenium and iridium) is nearly all from the nickel copper ores of the Sudbury district. In accordance with the low production of these ores in 1922, the amounts of metals of the platinum group produced were small, only 187 ounces of platinum and 341 ounces of palladium. Of rhodium, osmium, rutherium, and iridium, 126 ounces were produced altogether; separate statistics for each of these are not available. Of the total amount of platinum produced last year in Canada all but eleven ounces was from Sudbury ores, the British Columbia placers producing the eleven ounces. The metal is found in small quantities in many of the gold placers of British Columbia, and during 1918 the Department of Mines operated two drills near the Tulameen River in the Similkameen district in order to test the surrounding rocks for the source of the alluvial platinum, but nothing profitable was discovered.

The average New York price during 1922 for platinum was $97.61 per ounce, palladium $65.00 per ounce, and osmium group $80.00 per ounce. The price this year has advanced and recent New York quotations on platinum are $118.00 per ounce.

The advice of the Bureau of Mines to persons who are asked to speculate in a platinum property is to let it alone unless they are prepared to go to the expense of a careful examination by a competent engineer.

IMPORTANT SCIENTIFIC MEETING FOR CANADA

The announcement that the British Association for the Advancement of Science will meet in Toronto next September has created a great deal of interest. The dare of meeting has been provisionally set for September 3rd to 10th, 1924, and will thus give the visiting members an opportunity to attend the Canadian National Exhibition.

GYPSUM PRODUCTION OF CANADA, 1922.

The Dominion Bureau of Statistics, Mining, Metallurgical and Chemical Branch, issues the following finally revised statistics on the production of gypsum in Canada during 1922.

The total output of gypsum rock in Canada during 1922 amounted to 484,629 tons, of which quantity 145,954 tons or 30 per cent. was calcined. The quantity quarried, by provinces, was: Nova Scotia, 281,861 tons; New Brunswick, 56,692 tons; Ontario, 106,829 tons; Manitoba, 39,147 tons; and British Columbia, 100 tons.

For statistical purposes the production of gypsum is considered to be the sum of the quantities disposed of in the different marketable forms, care being taken to avoid duplication; the values used are those at point of shipment.

Shipments of all grades totalled 559,265 tons valued at, $2,160,898, an increase of 172,715 tons and $375,360 over the 1921 production. The 1922 production included lump or mine run, crushed, fine ground and calcined gypsum sold; calcined gypsum used in the clacining plants for the production of wall plaster, alabastine and other gypsum products was also included. The average value per ton received by operators throughout Canada was, by grades; lump, $1.52; crushed, $2.26; fine ground, $6.22; and calcined, $10.67. Prices during the previous year averaged as follows: lump, $1.78; crushed, $2.56; fine ground, $3.42 and calcined, $10.61.

SHIPMENTS OF GYPSUM BY GRADES IN CANADA, 1922.

	Tons	Value
GRADE:		
Lump or Mine Run	350,650	$ 534,160
Crushed	68,181	154,197
Fine ground	5,769	35,880
CALCINED:		
Calcined gypsum sold	25,339	309,879
Calcined gypsum used in the manufacture of gypsum products, such as wall plaster, alabastine, etc. (Weight and value of gypsum content only)	109,326	1,126,782
TOTAL SOLD OR USED	559,265	2,160,898

SHIPMENTS OF GYPSUM, BY PROVINCES, IN 1922.

	Tons	Value
Nova Scotia	332,404	$ 580,148
New Brunswick	82,462	517,668
Ontario	110,227	621,668
Manitoba	34,072	440,914
British Columbia	100	500
TOTAL FOR CANADA	559,265	2,160,898

GOVERNMENT POSITION OPEN

6110—Two assistant chemists in the Food and Drugs Division, Department of Health, one at Ottawa and one at Winnipeg, are required. The initial salary will be $2,100 per annum, which will be increased upon recommendation for efficient service at the rate of $120 per annum until a maximum of $2,580 has been reached.

Duties—Under direction to make chemical analysis and physical examinations of substances; analyze foodstuffs and drugs, etc.

Qualifications—Graduation from a recognized university, with special training in analytical chemistry, preferably three years of laboratory experience.

In the case of the Winnipeg appointment, preference will be given to residents of Manitoba, as provided by the Civil Service Act.

Application forms, properly filled in, must be filed with the Civil Service Commission, Ottawa, not later than October 25th.

INSTITUTE MEMBER SEEKS POSITION

Chemist, F.I.C. (Great Britain), F.C.I.C., seeks responsible position where good use could be made of his technical training and wide experience. Apply Box No. 31, CANADIAN CHEMISTRY AND METALLURGY, 57 Queen Street, West, Toronto, Ont.

Meeting of Council of Canadian Institute of Chemistry

PROGRESS REPORTED IN ORGANIZATION. PLANS FOR LOCAL MEETINGS. ANNUAL MEETING AT KINGSTON, MAY 1924.

THE Council of the Canadian Institute of Chemistry met at Ottawa, September 28th, holding both morning and afternoon sessions. President A. C. Neish was present, with the following members: Dr. A. T. Charron; H. Freeman; Prof. R. Harcourt; H. J. Roast; Dr. F. T. Shutt; F. G. Wait, and L. E. Westman, Secretary.

Following the reading of the minutes of the last Annual Meeting, reports of the secretary and treasurer were considered. The secretary pointed out that the employment work of the Institute seemed to be finding favour with both companies and individual chemists, and, in time, would become a very excellent service. It needed the co-operation of all members, so that new openings might come to the attention of the secretary and members of council.

On September 28th, the membership in good standing was as follows: 178 Fellows; 57 Associates; 68 Students. Following instructions of council, issued at the May meeting, 4 Fellows, 1 Associate and 7 Students, were suspended for non-payment of dues. During the interval, the Institute lost a prominent member through the death of Dr. P. C. Potvliet, F.C.I.C., late chief chemist of the Dominion Sugar Co., Chatham, Ont.

Since the annual meeting in May, 7 Fellows, 5 Associates and 1 Student, have been elected to the Institute. Two of these Associates were former student members.

The treasurer, Prof. J. W. Bain, reported that the bank balance on September 28th, 1923, was $1,051.86. The Institute owns, in addition, a Victory Bond, at $1,000. During the interval, May to September 28th, receipts, including initiation fees, amounted to $343.58, while expenditures amounted to $573.29 for the same period. It was estimated that $300 would be sufficient to carry office work, postage and printing, to the end of 1923, so that a sufficient sum would be available to carry the expense of council meetings and transfer, at the end of the year, a sum equal to the initiation fees for the year to the reserve. While the Institute is living within its true income, the reserve is not equal to the initiation fees of all members, and the council expressed the view that it would be a good policy to attempt to gradually build up the reserve to this amount. The council approved expenditures to date.

A motion was passed, authorizing the secretary to write a general letter to members having in view the recording of all those who undertake consulting work or analytical work, on a stated fee basis. The council considered it advisable to assist in creating a group of consulting chemists within the Institute, and it was felt that such a group, when organized, could work out co-operative plans of value to themselves and chemists in general. An opportunity will be presented at the next annual meeting for a full discussion of this development. In the meantime, a start toward co-operation might be made in larger centres .

The president was authorized to appoint a committee to consider the formation of a general code of ethics for chemists.

Dr. Georges Baril and Dr. F. T. Shutt were appointed a committee to take up with the Dominion Government the question of financing the International Chemical Union. It appears that in the great majority of the countries in the Union, the cost of membership is undertaken by some department of the Government. The situation, as it exists so far in Canada is, therefore, to this extent, unusual. The following resolution was passed, following a unanimous expression of opinion that the Institute should assist the chemists of any particular Province, should they desire to secure special legislation:

"In as much as the chemists of the Province of Quebec, at a general meeting, convened May, 1923, for the purpose of discussing the desirability of starting action, with a view of obtaining legislation, resolved to continue their activity in this regard, we, the Council of the Canadian Institute of Chemistry, endorse such action in principle."

In connection with the making of a census of chemists, Mr. S. J. Cook made a report of work done to date, and outlined a plan that will, in general, be followed in the work. His survey is still incomplete, but he has secured the names of over three hundred (300) individuals who are eligible, and are not at present enrolled. In this work, the universities have co-operated. It will now be necessary to secure a check on the list gathered, by securing still further information from individual members in different large or small centres, who may make a complete local survey.

When every source of information has been tried and checked, the Institute will have a very complete list of possible members, and it is proposed to reach every non-member with a letter, setting forth the value and activities of the Institute. In special cases, members of the Institute can call upon individuals and discuss the question of membership.

Mr. F. G. Hambly, chairman of the legislation committee, reported progress. His committee consists of Dr. J. S. Bates, Dr. A. R. MacLean, Dr. A. C. Neish and Prof. J. W. Bain. In addition, it is his purpose to consider specific points and questions with individual members of the Institute, and with the council.

Following the last annual meeting, a revision of qualifications distinctly higher than those at present in force was considered advisable. Machinery for a definite examination system is also considered necessary. The proposed changes will include those passed by the May convention, and reported in June issue of this journal, along with detailed changes that may seem essential. The whole will be submitted to the membership by letter ballot, probably about the beginning of the year.

Plans for meetings during the winter session were considered, and these will be held in Montreal, Ottawa, Toronto, and Kingston. Informal meetings may be arranged in Winnipeg and Vancouver.

The Council expressed itself as being extremely gratified with the organization progress of the Institute, particularly with activities in the Maritime Provinces.

It was felt that at frequent intervals it was most desirable to have members gather at local centres, so that expressions of opinion might be had on matters of general professional interest.

The next meeting of council is planned for Jan. 11th, at Montreal.

The annual meeting will be held at Kingston, Ont., late in May.

UNIVERSITY STAFF APPOINTMENTS

Dr. E. Gordon Young, of McGill and Cambridge universities, late associate professor of bio-chemistry at Western University, London, Ontario, has been appointed to the chair of bio-chemistry at Dalhousie University, Halifax, N.S.; Raymond J. Bean, graduate of the University of New Hampshire has been appointed to the department of histology and embryology; and James Nelson Gowanloch, lately head of the biology department of Wabash University, Indiana, has been appointed to the department of biology.

A number of changes have been announced in the staff of Queen's University. Prof. Earle White, Truro, N.S., has been appointed lecturer in chemistry, and Prof. S. H. Carsley, B.Sc., McGill, fellowship in medical chemistry. Dean Skelton has been given leave of absence to attend the Imperial Conference as the Prime Minister's expert economic adviser and Kenneth Johnston, of Toronto, has been appointed to take over the Dean's work. The resignation of Prof. Ashely, who is going to England, and the appointment of Prof. Symonds, who becomes professor of philosophy in King College, were announced.

AMERICAN INSTITUTE OF CHEMISTS, INC.

On September 20th, the American Institute of Chemistry was incorporated. Following a dinner, a general business meeting was held, with Dr. Horace G. Byers, president, in the chair. After a vote on the matter, the membership had decided to use the word "chemists" in place of "chemistry" in the name.

Prof. Charles Frederick Chandler, the Dean of American Chemistry, was elected the first honorary member.

Dr. Arthur C. Neish, president of the Canadian Institute, and L. E. Westman, secretary, were present, and conveyed the greetings of the Canadian Institute to the newly established American organization. Prof. Neish pointed out that the formation of such a professional organization in the United States was long overdue. Chemists should establish standards of professional attainment for themselves. These standards must be high, and tend to elevate the profession. He pointed out that for a long time the Institute would be a society to which the members must give, rather than one from which they would receive. Mr. L. E. Westman reviewed the history of the development of the Canadian Institute, pointing out the type of difficulties that arise in creating the machinery necessary to operate such a body under a Government charter. Professional objectives are most difficult to formulate, and are, at best, a gradual co-operative development

Dr. Byers reviewed progress to date, and issued a call for high endeavor on the part of all members. Plans for chapters in States are arranged, and official State representatives will be appointed.

PERSONAL

Mr. C. Price-Green has been appointed Director of the new department of the Canadian National Railways, the Department of Colonization and Development. His headquarters will be at Montreal. Mr. Price-Green is exceptionally well-known among chemists, metallurgists and mining men, throughout Canada, and has, for many years, studied the location and practical development of our resources, in a national way. His personal knowledge of Canadian resources, supplemented with the data accumulated by his department, give the National lines a big advantage in the development of this work. His appointment to this post is an assurance that there will be well-directed activity along every line that offers possibilities for mining and industrial development within the range of the National Railways

Mr. Charles Camsell, Deputy Minister of Mines, Ottawa, is now in Europe, investigating French and German methods of mining oil from oil lands which have ceased to produce wells.

Mr. S. C. Robinson, B.S.A. has been appointed Assistant in Chemistry at Macdonald College. Mr. Robinson is a graduate of the University of Alberta.

Mr. Everett A. Carleton, M.Sc., who has for the past two years assisted in the research on soil acidity carried on in Macdonald College under the grant from the Honorary Advisory Council for Scientific and Industrial Research, has been appointed chief chemist of the Kentucky Rock Asphalt Company, Bowling Green, Kentucky. Some of the results of Mr. Carleton's work at Macdonald College are being published in *Soil Science*. The full report of the research is in the hands of the Research Council.

Dr. F. Zeidler, secretary-treasurer and chemical director of the Dickinson Dye Works, Limited, Toronto, has been appointed a member of the Committee for Research and Standardization of the Canadian Woollen Manufacturers' Association.

Mr. Horace Freeman is at present doing development work at Shawinigan Falls, P.Q., with the Canada Carbide Company. This is the outcome of a metallurgical research conducted at Vancouver, under the auspices of the Research Council.

NEW BOOKS REVIEWED

"Le Mazout"

By E. Davin, Senior Naval Engineer. Published by A. D. Cillard, 49 rue des Vinaigriers, Paris, 1923. 96 pp. $5\frac{1}{4}$ x $8\frac{1}{2}$". Price Fr. 20, postage Fr. 1.50 (France), Fr. 2 (Foreign).

The author has given himself the task of collecting a considerable amount of data on fuel oil which were scattered in various periodicals (mostly in English and in German) to make them readily accessible.

After a brief outline of the composition petroleums, Davin takes up the analysis of fuel oils and devotes 29 pages to methods of determining density, flash point, burning point, viscosity and fluidity, water, asphalt, acidity, corrosion of metals, material soluble in sulphuric acid, cold test, ash distillation test, calorific value and sulphur.

He then goes on to study the applications of fuel oil, especially in the navy. He first discusses pipe lines, giving the various formulas proposed for calculating the loss of head in pipe lines, capacity of pumps, flow of oil, etc. The factors affecting the efficiency of combustion of fuel oil under boilers, the various methods of burning it and the different types of burners are dealt with in turn.

Various documents, specifications and tariff regulations are given, which are of but little interest to other than French readers.

Finally, the author briefly points out the danger of explosions and how to prevent them, and discusses the construction of storage tanks. L. W. Bates' work on colloidal fuel is reviewed and an account is given of experiments being carried on at the present time in France with this class of fuel.

This little book will be especially appreciated by the practical man, who has neither the time nor the facilities for hunting through the literature, and who will thus have at hand a very useful source of information.—A. P. C.

"A Symbol of Safety"

By H. C. Brearley. Doubleday, Page & Co., New York

The Underwriters' Laboratories, of Chicago, have, from small beginnings, accomplished great things, and have contributed much to our sense of safety. In this, chemistry has had a large part, and this book deals in a very delightful way with the work done by this organization. The scope of the work has broadened to the point where it includes safety devices of all kinds. Fire prevention is only one of the many interesting activities.

BRITISH CAST IRON RESEARCH ASSOCIATION DOING EXCELLENT WORK

The work of this recent research association is producing good results for the trade. Bulletin No. 1, containing some very practical notes on foundry practice, and a very complete survey of the literature, is now available. The problem of the Association is to produce, through research and co-operation, a better and more-widely-used range of products. Good work along the same line has been done in the United States. It has been proven once again that research, when it involves a genuine service to the industry in general, pays in a striking manner.

A feature of the first publication are the notes by F. J. Cook, vice-chairman of the council. Here is set down in very concise form a fund of information for the specific guidance of operators in several departments of foundry work. The abstracts from current literature are most complete, and anyone following this work closely should be able to improve their foundry practice to a notable degree. The offices of the Asoociation are: Central House, 75 New St., Birmingham, and chemists interested in this type of work should certainly be in touch with these reports of investigations.

DEATH OF DR. E. K. MUSPRATT

An international figure in chemistry was removed on September 1st when Dr. E. K. Muspratt passed away at Seaforth Hall, Widnes, England, in his 91st year. He was a well known chemist, a great educationist and philanthropist. His father, the late James Muspratt, was the founder of the chemical industry in England, having in 1823 established the alkali industry at Liverpool, using the Le Blanc process. At the time of his death Dr. Muspratt was president of the United Alkali Company. His son, Sir Max Muspratt, Bart., is chairman of the company and is also chairman of the Association of British Chemical Manufacturers and vice-president of the Federation of British Industries.

The late Dr. Muspratt had a most active and remarkable career. At ten years of age he was sent to boarding school at Worksop, where besides learning French and German, he became a proficient gymnast and football player. One of his accomplishments was dancing, an art in which he progressed later under the direction of the daughter of his master, Baron von Leibig at Giessen, to which place he was sent after six years at Worksop. It was under the influence of the great German chemist Leibig that Dr. Muspratt's life work was begun. Under Leibig's advice, he took a medical course at Giessen, later taking further chemical researches under Leibig at Munich.

Upon completing his education in Germany, he took charge of his father's metallurgical works at Woodend and the alkali plant at Liverpool. His knowledge of metallurgy he found of great use when improving the smelting of the poor copper from Wicklow pyrites, the Spanish ores not having been introduced until some years later. He was one of the pioneers in the formation of the United Alkali Company, a vast organization controlling at its inception forty-eight works, of which forty-five were chemical and three salt.

But Dr. Muspratt had other interests besides his numerous business activities. As a young man politics had a special charm for him. For ten years 1880 to 1890 he was president of the Widnes Liberal Association and was the Liberal candidate for Widnes the year following the Redistribution Bill, but owing to the large Irish vote, going solidly for the Conservative candidate by the temporary alliance between Parnell and that party, Dr. Muspratt was defeated. His defeat was regarded as more fortunate than otherwise for it left him free to devote his whole public energy to the cause nearest his heart—education, and along with three or four other enlightened men, the University of Liverpool was founded. To this University he devoted time, thought, enthusiasm and money.

Dr. Muspratt was a man of most powerful personality, with a breadth of outlook and interest which was probably not equalled by any of his contemporaries. He was one of the pillars of British industry, and one of the men to whom Great Britain really owes a large measure of its industrial prominence.

THE DESTRUCTION OF PLATINUM CRUCIBLES

The destruction of platinum crucibles, which is always attributed to a chemical change in the platinum, can be prevented (according to a publication by Heraens), if unnecessarily high temperatures in heating the crucible are avoided. The combinations of platinum with carbon, silicon, boron, phosphoric acid, etc., arise through reduction of the salt being heated at relatively high temperatures. The ease with which hydrogen and hydrocarbons pass through glowing platinum makes such a reduction easy. The use of acetylene for heating platinum, is for this reason, especially dangerous. Melted alkalis, alkalijne carbonates, in the presence of sulphur, or potassium cyanide, strongly attack platinum at high temperatures.

Easily fusible metals and easily reducible metallic oxides cannot be treated in platinum, and the same is true of all substances which give off chlorine, bromine, iodine, sulphur or phosphorus.—*Chemiker-Zeitung:* July 24, 1923.

Present Status of the Proposed British Columbia Steel Industry

SUMMARY OF ALL FACTORS BEARING ON SCHEME
(Specially prepared for Canadian chemistry and Metallurgy by our B.C. representative)

The Coast Range Steel Corporation has jumped suddenly into world prominence through the publicity given to a conference that was held at British Columbia house in London, on September 10, between the English backers of the company and the Hon. John Hart, Minister of Finance for British Columbia. Among those present were: Sir W. H. Ellis, managing director of John Brown & Company and of Davy Brothers and president of the Iron and Steel Institute of Great Britain; Sir John Noble, vice-president of Armstrong-Whitworth Company; Thomas V. Miles, managing director of Newton Chambers Company; W. Colquhoun, managing director of Semet Solvay Coke Company; W. A. Walker, managing director of Freyn Brassert; G. R. Dobson, secretary of Partington Steel & Iron Company; and C. P. Williams and Sir W. Brancker, president and director, respectively, of Coast Range Steel Corporation. The object of the conference was to assure the British Columbia Government, through its Minister of Finance, that if it would guarantee one-third of the company's 12 million dollar bond issue, both the guaranteed and unguaranteed bonds would be taken up at once and construction work on the plant started at the earliest possible date.

H. J. Landahl, the promoter of the company, approached the British Columbia Government in the spring of last year with regard to the guaranteeing of these bonds. He stated that the Imperial Government through the Trade Facilities Committee and the Dominion Government each had guaranteed one-third of the bond issue, and if the Provincial Government would do the same English backers had undertaken to underwrite the issue. After consultation with his colleagues, the Premier, the Hon. John Oliver, stated that his Government was prepared to guarantee one-third of the issue, provided the Imperial and Federal Governments guaranteed the other two-thirds on equal terms and provided, further, that when the plans of the company were put into concrete form experts to be appointed by his Government approved of them. A difficulty at once arose from the Trade Facilities committee demanding a first lien on the assets of the company, a demand that Mr. Oliver refused to approve. So far as can be learned, the Federal Government has not as yet taken any definite action in the matter.

The foregoing is the position of affairs at the present time. The Premier's offer, it is understood, still holds good, but it is subject to the important proviso of approval of the plans of the company by experts to be appointed by the Government.

Recently Mr. Landahl has been active in appearing before boards of trade in British Columbia, seeking their endorsement of his scheme, and, though he has succeeded in getting the endorsement of some of the boards, recently his scheme has met with a considerable amount of acute opposition. The intellectuals—as Arnold Bennet is so fond of calling those who think deeply, as opposed to those who rush heedlessly on—have been making their voices heard. Following cable advice of the conference in London, a meeting of the business men of Vancouver Island was held in Victoria, on September 12, to condemn the Landahl scheme. H. S. Munroe, general manager for and one of the vice-presidents of the Granby Consolidated Mining Smelting & Power Company, stated frankly that the scheme had not one chance in a million of success. H. Mortimer Lamb, secretary of the B.C. branch of the Canadian I.M.M., accused Mr. Landahl of dealing in elusive and illusionary possibilities, rather than facts or even probabilities; and that he had ignored the published estimates of trustworthy Government officials. Others pointed out that already British Columbia was labouring under a per capita debt of $38.64, which had been largely brought

about by the fathering of railway and industrial enterprises about which the Governments had no intimate acquaintance.

Mr. Landahl is pre-supposing an almost unlimited supply of cheap coke from Vancouver Island coal. In June of this year, the Geological Survey issued a memoir by the late J. D. MacKenzie, giving his estimate of the coal reserve of south Vancouver Island. MacKenzie found that the Nanaimo basin contained 34 million tons of actual and 67 million tons of probable coal, and the Comox field 19 million tons of actual and 39 million tons of probable coal that could be mined profitably. The estimate given in "Coal Reserves of the World", according to Mackenzie's estimate, was about 600 per cent. too high.

With regard to the cost of coke, last year, it cost the Granby company, which owns its own coal mine, its own by-product coke-ovens, and its own tugs and scows to move coal from mine to ovens, $10.88 per ton to produce coke. J. J. Warren, president of Consolidated M. & S. Co., stated that coke cost his company close to $14 per ton delivered at Trail. Alfred Stansfield, professor of metallurgy at McGill University, in a report made to the B.C. Government in 1918, estimated the cost of mining 55-per cent. iron ore in British Columbia at $4 per ton. The cost probably has increased 50 per cent. since that time. In the face of these figures it is difficult to see how iron can be produced at the present time in British Columbia at prices that will compete against British, Belgian, or United States metal. Much could be said, too, about the uncertainty of the market, but lack of space prohibits.

It may be asked, why, then, do influential British concerns back the project. The answer is, because if the three Governments guarantee the bonds there is much to gain and little to lose. The British firms between them expect to supply all the material and to erect the plant; and from this there should be sufficient profit to cover all possible losses and still leave a substantial surplus.

A QUICK METHOD OF SORTING METALS AND STEELS WITH THE SPECTROSCOPE

Metal scrap or metals of uncertain composition sometimes make a problem in classification, and cause chemists a vast amount of work. The spectroscope has been brought to the rescue. In fact, it seems an easy matter to state roughly the percentage of certain metallic constituents as fast as workmen bring them into contact with the electric arc.

One carbon steel bar is held in a suitable frame and the bars to be tested are placed in position on the same frame, one by one, rapidly, connection with the electric current being automatically provided through a suitable resistance. The arc is struck by touching both rods simultaneously with a third rod of iron or carbon steel, insulated with rubber at one end.

Removal of this rod strikes the arc, and the observer at the spectroscope is able at once to state, for example, whether the sample contains any appreciable quantity of nickel. By the aid of standard sample, the percentage in the sample under examination may be approximated. If the percentage of nickel is small, few of the nickel lines in the arc spectrum of a steel are continuously visible. In short, by knowing the significance of what we are looking for, and with a little practice, mixed lots of steel bars, collections of aluminum bars, manganese, bronze, may be quickly classified.

One of the English instrument makers, Adam Hilger, Ltd., London, has been demonstrating recently the speed and accuracy of this method with special instruments designed for this work.

Members of the Canadian Institute of Chemistry and others interested, are invited to hear Mr. Justice Riddell deliver an address on "Expert Evidence" before a general meeting of Toronto branches of professional engineering organizations on November 1st, at 8.15 p.m., at the Mining Building, University of Toronto.

SUCCESSFUL ENDING TO CHEMICAL EXPOSITION

More Business Placed By Exhibitors

Educational Features Proved Attractive

Plans for 1925 Made as Chemical Exposition Closed

The ninth National Exposition of Chemical Industries closed on September 22nd after one of the most successful years since its inception in 1915. According to exhibitors' reports, more business was placed at the Exposition this year than ever before. The restrictions placed upon the distribution of tickets, confining this distribution to channels more or less directly interested in chemicals, chemical equipment, and allied products, brought the desired results. The bulk attendance was cut materially, but the quality of visitors was much higher from the viewpoint of the buying power represented. The business placed is interpreted to indicate anticipated greater activity in several lines of chemical manufacturing. On the strength of results in the 1923 exposition, a well-known dyestuff house has doubled its contracted space for 1925. All told, the greatest change in this year's exposition was the notable trend toward the great market-place idea in chemicals and equipment.

Although the business end of the exposition, that is the sales and promotion end, were perhaps of greatest importance, the educational features this year proved very successful. Throughout the entire week of the exposition, the moving picture auditorium was filled. As in previous years, this proved extremely popular. The educational exhibits of the management displaying the progress of American chemistry, those of the American Chemical Society, of the Government department, of the Chemical Warfare Service, of the railroads, and of individual companies, all came in for a large share of attention. The success of the Students' Course in Practical Engineering and Chemistry, held in conjunction with the Exposition under the direction of Prof. W. T. Read, of Yale University, was undoubtedly due to the co-operation of thirty widely-known authorities in the chemical engineering and chemical business fields, who gave the students the benefits of their many years of experience in discussing their specialties. The students, representing a daily average attendance of about two hundred, are all in attendance in chemistry courses at various American universities.

All products shown at the Chemical Exposition were of American manufacture, with the exception of some Canadian exhibits of chemical raw materials, including the Mines Branch, Ottawa, and the Ontario Department of Mines. Among the products shown were all types of chemical equipment and machinery, many of the exhibits showing the machines in operation, chemicals, dyestuffs, metals, ceramics, asbestos, lacquers, instruments, containers from small glass vials up to steel tanks and cylinders, furnaces, filter presses, medicinal products, perfume and flavouring raw materials, belting, porcelain and chemical stoneware, fertilizers, various mills for grinding and pulverizing, evaporators, valves, general laboratory equipment, insulin and intarvin for the treatment of diabetes, pipes of iron, steel, non-corroding metal, rubber and glass and many others. A number of exhibits showed actual plant operations with the use of their products. Practically all booths contained some new feature or development which had not been shown in 1922. Many exhibits were new products and ideas throughout. About 400 exhibits were housed at the Grand Central Palace this year.

The Chemical Exposition this year marked the ninth one of its kind under the same management, the original exposition being held at the Grand Central Palace in 1915 with 64 exhibits. Of the nine expositions, eight have been held in New York, and one (1919) in Chicago. By a vote of the exhibitors the exposition will be held biennial instead of annual, the next show taking place in 1925. In nine years it is estimated that over nine hundred thousand persons have visited the Chemical Exposition. Over 75% of the first floor space has already been contracted for the 1925 show.

World Wide Chemical News

(Special Correspondence to Canadian Chemisrry and Metallurgy from Our London Representative)

Business in chemicals has been very restricted in Great Britain throughout the months of July and August, especially for domestic trade, and so far as export trade is concerned the July trade returns of the Board of Trade are sufficient indication of the falling-off which has taken place. While shipments abroad for July, 1923, were worth £1,739,561 as against £1,444,643 during July, 1922, they are £645,511 less that the exports for the month of June last. Imports of chemicals during the month showed a decline both from June 1923 and from July, 1922, the total trade being worth only £796,366, as against £831,976 for the corresponding month last year and as compared with £933,234 last June.

Statistics of trade between this country and Germany for the first six months of this year are now available and show that the imports of dyestuffs amounted to £270,000 compared with £505,000 for the whole of 1922, while for general chemicals the figures were £848,000 and £1,485,000 respectively. Imports have, therefore, been on a somewhat bigger scale this year than last.

Sulphuric Acid Plants Now Over 60% Capacity

Data are now available to make possible a review of the sulphuric acid industry during the year ended June 30th last, and the table set out below gives the salient features, from which it will be noted that there is an increase of 14% in the amount of the total plant capacity now in operation, bringing up the total amount in use to 62%.

	(000's omitted.) Pre-War 1913.	War Maximum 1917.	1921/22.	1922/23.
	tons.	tons.	tons.	tons.
Sulphuric Acid made (as 70% H_2SO_4)	1,500	1,970	985	1,225
Percentage of Plant Capacity used	85%	95%	48%	62%
Raw Materials used:—				
(1) Pyrites	800	871	358	365
(2) Spent Oxide	110	120	129	157
(3) Sulphur	3	45	16	45

Very little interest has been shown in the market for tar products, and pharmaceutical and other fine chemicals have shown a downward tendency.

Chemical Manufacturers To Have Large Display

For its collective exhibit at the British Empire Exhibition next year the Association of British Chemical Manufacturers has booked 30,000 square feet of space, and this has been sublet to about a hundred firms including many whose products are household words all over the world.

Glasgow To Have Smokeless Fuel

The Gas Committee of the Corporation of Glasgow have under consideration a proposal that important experiments should be conducted, under the asupices of the corporation, in the manufacture of smokeless fuel. The method of production suggested is that known as the Maclauring process of low-temperature carbonization.

Experimental plant on a fairly large scale was fitted up some years ago at the Corporation electricity station at Port Dundas, but the work had to be discontinued when the war began. Later, the inventor of the process erected a full-sized plant at Grangemouth, and it is claimed that the work done there has proved that a smokeless fuel, suitable for any kind of domestic fire and for steam-raising under any type of boiler, can be economically produced. From each ton of coal there is obtained about 10cwt. of good fuel, about 3cwt. of smithy char and breeze, and about 30,000 cu. ft. of gas of a calorific value of 250 B.Th.U., as well as about 15lb. of sulphate of ammonia and 15 gallons of oil containing valuable byproducts. The smokeless fuel can, it is claimed, be sold at about the same price as the ordinary coal required to produce a similar amount of heat and the gas at about a quarter of the price per therm of ordinary town's gas, especially to manufacturers and boiler users, who would consume large quantities.

It is now proposed that the Corporation Gas Committee should erect plant at their Dalmarnock gas works for the manufacture of the smokeless fuel and distribute the gas in large special mains to works in the neighbourhood.

New Motor Fuel

A British company has just been formed to establish a plant on the Medway (Kent) for the manufacture of a new motor fuel called Pynol. The new fuel is the invention of a Frenchman, and is a patented combination of light, medium and heavy hydrocarbons, gas oil, fuel oil or other hydrocarbons being blended with petrol, or alcohol or benzol, and ether and "something else". The original invention has been improved upon both in Germany and in England. The fuel has an oily nature, which allows it to act partly as a lubricant, to the benefit of the upper walls of the cylinders, but it does not dilute the oil in the sump. There is stated to be no ash content, and road tests have given considerable increases in mileage per gallon.

French Iron And Steel Competition

It is sometimes asserted that the post-war situation of the French iron and steel industry, following upon the re-annexation of Alsace-Lorraine, the control of the Saar Valley, and the receipts of German reparations coal, must enable that country to become a dangerous competitor with Great Britain in world markets. While the prospect of economic co-operation between French ironmasters and German coal interests as a means of settling the Ruhr imbroglio is one which arouses a good deal of reflection among British and other steel men, it is important to bear in mind that up to the moment France has not yet even resumed her pre-war position in the steel industry. Before the war France steadily and substantially increased her production of iron and steel. In the last pre-war year, France without Lorraine produced 5,250,000 tons of pig iron and its equivalent in steel and manufactures; in 1922, the record post-war year, France with Lorraine, with the assistance of Saar Valley and Ruhr reparation coal deliveries, only succeeded in producing 5,146,000 tons of pig iron. This year, production must for many reasons be much less, output for the first half of 1923 having reached 2,200,000 tons; this in spite of the fact that there are no unemployed workers in France. It is held by British steel men that France will be unable to operate her iron resources, now so largely increased, at half their potential capacity, having lost heavily in labour during the war both of native French foundrymen and of Polish and Italian workers upon whom she so largely depended.

Oil In Tasmania

Great interest is being taken in the search for oil on the north-west coast of Tasmania, where bores are being put down, and in one case a well is being drilled in the expectation of flow oil being located. In the area that is being searched immense deposits of shale yielding from forty to fifty gallons of oil to the ton exist, and reports that real oil seepages have been discovered are confirmed by the Assistant Government Geologist.

New Refinery Nearing Completion

It is expected that the oil refinery which is being erected at Altona Bay, near Melbourne, will be in operation before the end of this year, the operators being a corporation formed jointly by the Commonwealth Government and the Anglo-Persian Oil Company. Pending oil discoveries on a sufficient scale in Australia, the Anglo-Persian Company will supply a maximum of 200,000 tons of crude oil from Persia.

Tasmanian Carbide Industry

Owing to heavy imports into Australia of foreign carbide the new Tasmanian carbide works have been closed for many months, and the directors of the company have continued their efforts to get the Commonwealth Government to re-impose the embargo. The State authorities are supporting their claim to consideration, and as the result the Federal Government has notified the parties concerned that while the embargo on importation will not be reimposed, the Industries Preservation Act will be applied. With this assurance production has been resumed.

Export Of Oil Seeds And Vegetable Oils From China

Several varieties of oil seeds are exported annually from China, and, according to the report of the Chinese Maritime Customs, the principal kinds dealt with last year were sesamum seed, 1,257,766 piculs; rape seed, 612,776 piculs; linseed, 559,182 piculs; and cotton seed, 324,683 piculs. The aggregate for all kinds was 3,578,994 piculs, valued at Hk. Tls. 15,659,312. Of these seeds, only the exportation of linseed shows an appreciable increase when compared with the year 1921. The other three kinds of seeds mentioned all recorded important decreases, especially noticeable in the case of sesamum seed, which has declined from 2.8 million piculs in 1919 to 1.3 million piculs in 1922. The present season's sesamum seed crop is reported to be very satisfactory both as regards quality and quantity, so that it may be anticipated that large quantities will be exported. Seeds from China are shipped principally to the following countries:—Great Britain, Denmark, Germany Netherlands, Belgium, France, Italy, Korea, Japan, America, and Hongkong.

Last year was not a good year for the vegetable oil trade. Ground nut oil, which was once an outstanding item of this group, has steadily declined, and in 1922 registered only 383,521 piculs as against 1,224,173 piculs in 1919. The export of cotton seed oil showed a similar decrease, as also did tea oil and sesamum seed oil. Wood oil, however, which now ranks next in importance to bean oil, fortunately registered a noticeable increase as compared with 1921, the export last year totalling 75,565 piculs as compared with 419,549 puicls in 1921. The chief consuming centres for vegetable oils from China are Great Britain, Germany, Denmark, the Netherlands, Sweden, Italy, Belgium, Russia, Siberia, Japan and the United States.

French Iron and Steel Industry

The French iron and steel market remains quiet, with prices steady. There has been no recent improvement in the home demand, but export business has proved satisfactory, especially with Great Britain and the Dominions. Deliveries of Ruhr coke are at present very scanty, but French output is increasing, especially in the devastated regions, where the construction of coke ovens is proceeding actively. In the Lens mines, seventy coke ovens of the Koppers type have been in blast since November, 1922, and seventy new ovens were started a few weeks back. The mines of Aniche (Nord) also resumed coke manufacture last February in their new Gayant plant, and their forty remaining ovens have been blown in recently. At Dourges (Pas-de-Calais) the construction of two plants has just been completed and forty ovens are already in operation; furthermore, two new plants at the Homecourt Works are practically completed.

In June the French output of pig iron was about 445,000 tons, with 106 blast furnaces working, as against 395,000 tons in May (when ninety-nine were in blast), and 500,000 tons in December last. From August 1st the French Comptoir pour Ferro-Silicon is advancing the price of 25½ ferro-silicon to 750 francs and of 45% ferro-silicon to 1,000 francs, the 75% and 90% grades remaining unchanged at 1,650 francs and 2,000 francs respectively. The June output of raw steel was 427,000 tons, as against 414,000 tons in December last, and 397,000 tons in May. Progress is largely due to the development of the Martin open-hearth furnaces. It should be remembered that the potential output of the French iron and steel industry was approximately doubled by the re-union of Alsace-Lorraine with France, but the works have not been employed to more than fifty to sixty per cent. of their capacity even during the most favorable period since the war. In view of the limited domestic demand the large Lorraine firms have been forced to open up new outlets abroad, and particular interest is now being shown in the South American market, where Canadian steel interests are likely to meet with severe competition from this new quarter.

Italian Cyanamid Production

The production of calcium cyanamid in Italy last year reached 33,422 tons, as against 16,000 tons in 1921, and it is estimated that the 1923 consumption may amount to 40,000 tons. The consumption of this product is heavier in northern Italy, and varies from a maximum of fifteen kilos per hectare of cultivated land (seven pounds per acre) in the province of Novara to about one-half kilo per hectare (one-fifth pound per acre) in the provinces of Southern Italy, except Naples and Salerno.

New Norwegian Granite Find

Very valuable granite seams, of a particular sort used in American steel works for grinding and sharpening processes, have been found on a property near Kristiansund. Hitherto the granite has been exclusively imported into the United States from Spain. A contract has been drawn up between the owners of the property and an American company, and trial workings are to begin immediately.

Swedish Iron Ores

The deposits of iron ore in Norrbottens Laen are found to be much richer than has hitherto been assumed, and are estimated at a total of 1,500,000,000 tons, of which considerable quantities consist of ore with low phosphorus content. The deposits of Central Sweden cover 600,000 square miles.

Swedish Iron Works Dispute

For nearly five months the bulk of the Swedish ironworks have been idle; some 20,000 workers are affected by the dispute, the effect of which is becoming more serious every week. According to official reports, only 14% of the total number of blast furnaces and Lancashire hearths were working in the first quarter of the year, while practically all Bessemer and Martin plants were closed down. The total production of iron and steel reached only 20% of the 1913 figure.

Polish Chemical Production

The production of dyes in Poland is estimated at about sixty tons per month, centred in three manufacturing establishments.

Credits recently advanced by the government will, it is expected enable the superphosphates industry—which has been suffering from lack of capital for the purchase of raw materials—to attain peak production by the autumn.

Production of alcohol by Polish distilleries for 1922-23 is estimated at 890,000 hectolitres of pure spirit, about half of which is attributed to Pomerania, compared with 541,424 hectolitres for 1921-22 and 364,700 hectolitres for 1920-21.

Bauxite Discovery in Russia

Investigations in connection with the aluminium ore discovery near the River Tshussovaya (Government of Perm) have proved the existence of considerable quantities of bauxite and aluminite. Exploring work is being continued, and the production of aluminium will begin shortly.

DEATH OF ARTHUR NEWBOLD

Arthur Reginald Newbold, for the past several years analytical chemist for the Nova Scotia Steel & Coal Co., at Sydney Mines and New Glasgow, died suddenly at his home September 18th. He was a member of the Iron and Steel Institute of England.

Mining and Metallurgy in British Columbia

(Special Correspondence to Canadian Chemistry and Metallurgy.)

Smelter Activities

The Consolidated Mining & Smelting Company put its new concentrator at the Sullivan mine into operation on August 22. When it is tuned up to capacity, it is estimated that the plant will have a capacity of 2,500 tons of ore per day. With the exception of the electric motors and the heavy crushing machinery the whole of the plant has been constructed in the company's workshops and has been devised to suit the peculiarities of the Sullivan ore, which is a mixture of zinc-blende, marmatite, galena, pyrrhotite, and pyrite, with from three to six per cent. of earthy gangue. The completion of the plant may be said to be the fruition of seven years of patient and costly research, during which plant after plant was erected and scrapped and an endless number of laboratory experiments were carried out. Sometimes the laboratory experiments could be repeated on a commercial scale; sometimes they could not; and it is worth while mentioning one instance of temporary failure, to show how small a thing sometimes will upset one's calculations. A laboratory plant made of brass successfully separated the blende and marmatite from the pyrrohtite, but when a larger scale plant was made of wood it failed miserably. Finally, after much experimenting, someone hit upon the idea of feeding a few drops of copper sulphate solution into the cells, and, presto! it worked as well as the laboratory plant. This is just one instance of many that baffled Mr. Blaylock and his staff so often before success ultimately was achieved. But the great thing is that success now has been achieved, and a mine that at one time was thought to be almost worthless on account of the refractory nature of the ore has been turned into one of the most important lead and zinc mines of the world. The plant is situated four miles from the mine, this being the nearest point at which both an adequate supply of water and ample space for the dumping of tailings could be assured. It covers 12 acres of ground, and is housed in buildings made entirely of steel and cement-concrete. Except for minor details, it is a large-scale reproduction of the plant that has been treating the Sullivan ore successfully at Trail for the last two years, and which has been described on more than one occasion in "Canadian Chemistry and Metallurgy."

The concentrator at Trail will now be put into thorough repair and will be used for dressing the ores from the company's Rossland mines. For years these ores were treated by direct semi-pyritic smelting, but with the excessive rise in the price of coke since the war, this method of treating has ceased to be profitable, and was abandoned in April, 1922. It is expected that the copper department at Trail smelter will be put into operation sometime in October. The concentrates from the Rossland and Copper Mountain ores will be sintered and smelted in blast furnaces.

Copper Mountain To Be Restarted

H. S. Munroe, vice-president of and general manager for the Granby company is authority for the statement that productive mining would be re-started at Copper Mountain sometime between the middle and end of Septembr. For some months from 40 to 50 men have been employed in enlarging the concentrator and in making improvements at the mine. The 3,170-foot, or bottom level, has been re-timbered and enlarged, and the tramway connecting it with the railway has been repaired. The mine and plant is now in first-class condition for production on a large scale, and as soon as the Kettle Valley Railway Company finish the repair work on the spur line from Princeton to the mine the plant at Allenby will be put into operation once again.

The dam for the new reservoir at Anyox is nearly finished. This will provide ample power throughout the year and make the company entirely independent of fuel for power purposes. Mr. Munroe stated recently that he expected the new 1,500-ton concentrator to be finished before the end of the present year. These two improvements are expected to make a marked cut in the cost of copper production. During the year, the Granby company has been busy examining other properties and has spent a considerable sum in exploration work. It has taken an option on a recently-discovered property on the west branch of Texas Creek, a tributary to the Salmon River. The vein on this property is said to be four to eight feet wide, to have been traced for 7,500 feet on the surface, and to average $75 per ton in silver and lead at the points where it has been opened. The company has let contracts for diamond drill work at the Outsider mine and the Sultana group of claims.

Arsenical Pyrite Discoveries

The demand for insecticides, particularly in the southern states, and the resulting increased price of arsenical ores has stimulated the search for arsenic; and what gives promise of being important discoveries have been made. R. G. McLeod, of Vancouver, reports the discovery of a strong vein, heavily mineralized with arsenopyrite in the vicinity of Kanaka, on the C.P.R., nine miles east of Lytton. The ore is said to assay $30 in gold per ton and 20 to 30 per cent. of arsenic. There is said to be a 30-foot vein of silver-lead ore on the same property. Messrs. Trites, Wilson and Wood, of Fernie, have taken a short option on the property, and will make a thorough examination. A. L. Juell, of Mount Vernon, and W. E. Narkus, of Seattle, have bonded a property on the Kettle Valley Railway that has been prospected extensively for gold. They report that a contact vein between schist and limestone has been traced for 6,000 feet, and at one point an adit has been driven for 200 feet and at another a shaft has been sunk to a depth of 175 feet. The vein ranges from three to eight feet in width, and is said to carry $12 per ton in gold and 20 per cent. of arsenic. Ronald Campbell-Johnston, of Vancouver, reports a strong vein heavily mineralized with arsenical pyrite near Hope. It is said to average $5 in gold and assays have given 38 to 40 per cent. of arsenic. Mr. Campbell-Johnston is seeking capital for the development of the property in London.

Capital Interested In Portland Canal District

The phenomenal record of the Premier mine has attracted a number of eminent geologists and mining engineers to the district. Malcolm McLaren spent two weeks in the district and visited every mine and prospect of any importance. Drs. Bancroft, of McGill; Moore, of Toronto University; Lindgren, of Massachusetts Institute of Technology; and Batemen, of Yale, all spent some time in the district.

Montreal and Toronto capital continues to show its faith in the district by bonding the Hercules group, adjoining the Big Missouri, at the head of Salmon River. The exploration of the property has been started. The London syndicate that has the Prince John and M.C. groups under option has about 40 men employed at camp and trail construction, with a view to maintaining operations during the winter. The camp at the M.C. group is of a permanent nature, the bunk house being built of stone. Dunwell Mines has started another adit, which will give an additional 150 feet of depth on the vein, and is repairing some miles of flume and laying 4,000 feet of pipe, to connect the old Portland Canal Company's compressor with the mine.

Premier Purchases Controlling Interest In B.C. Silver Mines, Limited

The Premier Gold Mining Company called a special meeting of its shareholders for September 17, at Vancouver, to authorize the purchase of 490,349 shares in the capital stock of B.C. Silver Mines, Limited, and 1,000 shares in The Premier Southern,

Incorporated, the latter packet of shares being the whole of the authorized stock in the company, which was incorporated under the laws of the State of Delaware. The shares in B.C. Silver Mines are held by six private individuals, who, presumably, gave options on the shares to the directors of the Premier company.

For some time the Premier company has been seeking to obtain a controlling interest in B.C. Silver Mines, because the latter company's property adjoins the Premier property on the north and south, which is the trend in which the rich veins course. Some 18 months ago, the Premier company made an offer of one million dollars for the two-thirds interest that the Selukwe company of London held in B.C. Silver, but the offer was refused. Since then the Premier main vein was cut by a tunnel on B.C. Silver property, and, it will be remembered, the price of the Selukwe shares rose fourfold in consequence. Since that time Selukwe shares have fallen to about the point at which they stood before the vein was cut.

West Kootenay

Another sensational strike of Bonanza ore has been made at the I.X.L. mine, at Rossland, two autotrucks of ore sent to the Kellogg smelter having yielded more than $24,000. It will be remembered that ore of a similar nature was struck at this mine in 1921 and yielded in the vicinity of $80,000. The ore is obtained from what the miners call a chimney, or a narrow short sheet. The mine is owned by J. R. Baker, of Tacoma, and operated by eight lessees on a 20 per cent. royalty. The new vein at the Ruth mine is said to be developing well, and bids fair to considerably increase the ore reserve. The mine is shipping steadily. The Clarence Cunningham group of mines, which did so well in 1920, are again showing up well, and Mr. Cunningham's Alamo mill is send ng a steady of concentrate to Trail. The Wonderful is the best producer of the group. The Standard Silver-Lead Company has opened the vein at the Iva Fern mine at a point 2,100 feet from the original discovery. The vein is 30 feet wide at this point and well mineralized. An adit has been started from this opening, which will give a depth of 550 feet at the point of discovery. A water power is being developed on Cultrus Creek and a compressor is being installed. The agreement between Florence Silver Mines and the group of Detroit capitalists, whereby the latter were to have purchased a controlling interest in the company, has collapsed. The company now proposes to float a bond issue to enable it to fulfil its agreement with the city of Nelson, whereby the city was to supply the company with power and construct half of a 20-mile high-tension line. The Florence mine is in excellent physical condition, but never has recovered from the disastrous effects of the lead pool. It has been shipping a high-grade concentrate to the Kellogg smelter steadily for some time.

Valuable Gold-Silver Ore Discovered at Dunwall Mine

What promises to be an important discovery has been made at the Dunwall mine, on Glacier Creek, three and a half miles from Stewart. An adit that was being driven on an eight-foot vein struck an ore-shoot at 280 feet from the portal. The adit was being driven on the foot-wall, so, to find the width of the shoot, a cross-cut was started towards the hanging-wall. This cross-cut has passed through seventy feet of milling ore with occasional bands of high-grade ore. At one point twelve feet of ore is said to sample $14 in gold and eleven ounces of silver per ton and sixteen per cent. of lead. The strike has caused considerable excitement in the district, and has resulted in the staking of about 100 new claims along the Bear River. Further work is needed, of course, to really determine the value of the strike. The company is well provided with funds, and the development will be pushed.

A new strike has been made on the west fork of Texas Creek, and, though this is in Alaska so does not properly come in British Columbia news, it is important in that it extends the known limits of ore-bearing formation some ten miles westward. The vein, which is from four to eight feet wide, is said to have been traced for 7,500 feet. Assays run in the vicinity of $75 per ton in gold, silver and lead.

The Kootenays

The Standard Silver-Lead Mining Company has started an adit 1,800 feet from the new discovery at the Iva Fern mine, on Cultrus Creek, which was described in detail last month. Besides exploring another part of the vein, this adit will give an additional 350 feet depth on the ore-shoot. Should this development prove the continuation of the shoot, a mill will be erected. A power plant is being developed on Cultrus Creek and a compressor will be installed to hasten the development of the property.

The Consolidated Mining & Smelting is greatly increasing its force of men at the Rossland mines, preparatory to starting productive mining, again, which was stopped in the spring of last year, because it was no longer possible to treat the ore by direct smelting, owing to the exhorbitant price demanded for coke. It is expected that the new Sullivan concentrator will be started before the end of the present month, August, and this will release the 1,000-ton smelter at the Trail smelter, for the dressing of the ores from the company's Rossland mines.

A Spokane syndicate has re-started operations at the Tangier-Waverley mines, near Revelstoke. These mines were among the first to be located in the Province, but, although some good ore was developed, it would not bear the cost of shipment to South Wales, so the mines were closed, and no work has been done during the last twenty-five years. Road construction is now under way, and when this is completed shipping by tractors to the C.P.R. line will be commenced. A good body of ore is said to have been developed

CEMENT PRODUCTION OF CANADA

The Dominion Bureau of Statistics, Mining, issues the following revised statistics on the production of cement in Canada during 1922.

The sales of cement in Canada in 1922 of 6,943,972 barrels exceeded the previous year's sales by 1,191,087 barrels. The total mill output amounted to 6,447,696 barrels, a decrease of 1,960 barrels from the 1921 total. No puzzolan cement was produced during the year.

Ten plants having in all a daily capacity of 35,338 barrels, were operated during the year. In addition to these, there were at least twelve other plants in Canada which were idle during the whole period.

Ontario and Quebec were the principal producing provinces, sales from the former amounting to 3,104,386 barrels averaging $2.06 per barrel and from the latter 2,660,935 barrels at an average price of $2.22. The selling price in the other provinces was as follows: Manitoba $2.62; Alberta $2.33; and British Columbia $3.00, with a Dominion average of $2.22 per barrel.

OUTPUT, SALES AND STOCKS OF CEMENT IN CANADA, 1922.

	Barrels	Value
Output	6,447,696	$14,324,715
Sold or used	6,943,972	15,438,481
Stocks, December 31, 1921	1,603,215	....
Stocks, December 31, 1922	1,106,939	....

NEW MEMBERS, CANADIAN INSTITUTE OF CHEMISTRY

F.CI.C.

Mr. H. H. Stephenson, F.C.I.C., Strathcona Hall, Montreal, Que.

A.C.I.C.

Howard McDougall Chantler, B.A., Sc., Canadian Malt Products, Limited, Guelph, Ont.

Industry and Trade

Industrial Developments----Trade and Company News----Financial Notes----Patents----Market Review and Prices

INDUSTRIAL DEVELOPMENTS

KENORA, Ont.—The Abitibi Power and Paper Co. are planning to construct a newsprint mill here, with a capacity of 100 tons per day.

SUDBURY, Ont.—Owing to the fact that the Cutler lumber mill of the Spanish River Pulp & Paper Co., was destroyed by fire, with a loss of nearly $200,000, the Company has reopened its mill at Aird Island, which has been idle for several years.

MONTREAL, P.Q.—The plant of the Belgo-Canadian Co. is now producing 90,000 tons of paper per annum.

EDMONTON, Alta.—The Provincial Government is to experiment with tar sands, when paving one of the main trails into Edmonton, using six carloads of the crude sand. Mixtures of tar sand and crushed gravel, and of clay and tar sands, will be tested.

ST. CATHARINES, Ont.—Another paper mill, to cost $400,000 is to be erected here by the Garden City Paper Mills.

OTTAWA, Ont.—The Canadian Highways Commission have accepted highway projects in six of the Provinces, involving an expenditure of $9,336,373, as follows: Ontario—14 projects, totalling 100 miles; Quebec—6, totalling 110 miles; Prince Edward Island—19, for 166 miles; Nova Scotia—29, for 278 miles; Saskatchewan—1, for about 3 miles; and British Columbia—11, totalling 130 miles.

MEDICINE HAT, Alta.—The Many Islands Oil and Gas Co., Ltd., is preparing their camp and constructing derrick, making the fourth company drilling for petroleum in this vicinity.

CLOVERDALE, B.C.—The highway has now been completed from Vancouver to Los Angeles.

PORCUPINE, Ont.—Since the opening of this camp, gold amounting to $11,967,094 tons, and valued at $104,599,633 has been produced.

COBALT, Ont.—During the first half of the present year the gold production in the Kirkland Lake Camp amounted to $1,402,873, an increase of 35 per cent. over the corresponding period last year.

SYDNEY, N.S.—For the first time since the war, the British Empire Steel Corp. is operating four blast furnaces at its plant here. This company is also planning to put into operation the battery of coke ovens erected some years ago by the Koppers Corporation.

TORONTO, Ont.—The new plant of the Ford Motor Co., costing nearly $1,500,000, has been completed.

The stock of the Liquid Carbonic Co., was damaged by fire to the extent of several thousand dollars.

EDMONTON, Alta.—The Alberta Carbon Coal Co., has been incorporated here, with a capital of $500,000.

VICTORIA, B.C.—The Weyerhauser lumber interests are erecting a $1,500,000 mill at Chemainus, Vancouver Island.

VANCOUVER, B.C.—The B. C. Berry Growers' Assn., are erecting evaporating plants at Hatzic and at Chilliwack, and also a juice plant at Clayton, the latter to have a capacity of five tons of berries per day, producing about 100 gallons of loganberry cider yearly.

ST. ANDREWS EAST, P.Q.—The Western Quebec Paper Mills, Ltd., expect to have their plant here in operation by the late Fall.

WINNIPEG, Man.—The Canada Bread Co., Ltd., are constructing a $12,000 addition to their plant here.

OTTAWA, Ont.—The Slinn Bread Co., has been acquired by the Canada Bread Co., for approximately $300,000.

BROCKVILLE Ont.—The Champlain Tire & Rubber Co., Ltd., of Ottawa, have acquired manufacturing premises here.

VANCOUVER, B.C.—A $1,200,000 grain elevator, with a capacity of two million bushels is being erected here by the Board of Harbor Commissioners.

CANADIAN SOAPSTONE DEVELOPMENT

Under the name, Thermo Stone Quarries, Limited, of Dryden, Ont., a new company, owning a deposit of soapstone, which has been very favorably considered by engineers, is about to be opened up. Mr. E. G. Pidgeon is president, and Mr. H. C. Humphreys, of the Dryden Paper Co., secretary-treasurer. The pulp and paper industry is a quite large consumer of soapstone, in the form of large bricks for furnaces. The use of the material in blocks and slabs is very extensive for refractory purposes, while powdered soapstone is used by rubber, paint, linoleum and roofing industries.

The important thing in a development of this kind is the nature of the deposit. So far, no Canadian deposit has been found that was of sufficient extent or from which large, unfractured pieces could be secured. Mr. F. O. Orr, of Montreal, and other engineers, report that this deposit is both extensive and of high grade. The ore body varies in hardness in a uniform manner, and is rated as quite large enough for all possible Canadian consumption. The method of working will be open quarry. The property is on Trap Lake, and is connected by water with C.P.R., a distance of nine miles from Dryden, Ont. In the report of Mr. Orr, a conservative estimate of commercial soapstone available would be 425,000 tons.

ROAD TO NEW GOLD FIELD

The Quebec Provincial Government is planning to construct a new road to the gold fields of Rouyn. The road, which will be thirty miles long, is to extend from the south end of Lake des Quinze, via Guerin, to Rouyn.

LARGE INCREASE IN PULP AND PAPER EXPORTS

The exports of pulp and paper from Canada during July were valued at $12,066,819, compared with $9,728,252 in the same month last year. These were divided as follows: United States, $10,493,904; United Kingdom, $884,127; and other countries, $688,788.

CANADA'S TRADE INCREASING

During the year ending July, Canada's exports to other parts of the British Empire amounted to $453,437,899, compared with $354,992,074 for the corresponding previous twelve months. Imports from Empire countries during the same period were $195,811,190, as against $153,185,581 in the previous year.

NEW COLD MOULDING COMPOUND

The Electroplax Co., of Toronto, is now manufacturing a new cold moulding compound, under the name of BAKELITE C.M. This material originated in the Redmanol Laboratories, in Chicago, and has been developed here.

The impact test pieces, made from this new mix, show from four to six times the strength of the same pieces made from the best of the C.M. compounds formerly on the market. The dielectric strength is much higher, as BAKELITE forms the binder. The heat-resisting power is equal to other compounds, and, in tests carried on, pieces showed no discoloration or distortion at 650°C.

NORTHERN ONTARIO DEVELOPMENTS

During August, the Nipissing Mining Co. mined silver ore valued at $173,459. The shipments of this company during the same period amounted to 451,595 fine ounces of bullion, valued at $284,696. This is a considerable increase over the figures of July, when 252,561 ounces (valued at $159,527) were shipped.

BUCKINGHAM HAVE 600 ACRE BLOCK

The Buckingham Mines have recently acquired eight additional claims, contiguous to the original three, and now possess a 600-acre block. One vein, six feet in width, and yielding samples of unusually rich ore has already been uncovered. New mining equipment is now on the property, and the camp buildings are being reconstructed.

PROMISING FUTURE FOR MATACHEWAN

Most of the land in the new Matachewan gold district has been staked, and is now being developed. Samples of ore from this area are most promising, and average a value of $12 a ton. The principal properties in the Matachewan camp are the Matachewan Canadian, the Matachewan General and the British Matachewan, all of which will receive power this fall from the Great Northern Power Co.

TOUGH-OAKES OPERATING 200 TON CYANIDE MILL

The new Tough-Oakes-Burnside Mines, Ltd., capitalized at $5,000,000, has acquired three additional holdings, as well as the original Tough-Oakes and Burnside claims, making a total of 420 acres. This company is now operating its new 200-ton cyanide mill.

At a recent meeting of the Hattie Gold Mines and Beatty Gold Mines, 220,000 shares of Hattie stock were disposed of to a syndicate composed of W. W. Butler, A. R. O'Neill and J. R. Papassarrakes, for $55,000. The Beatty Mines has sold to the Hattie Mines 40 acres adjacent mines, the mining plant, and $20,000 of treasury funds, in return for 1,450,000 shares of Hattie stock. The Hattie Mines are increasing their capital stock from $2,000,000 to $5,000,000.

INTERNATIONAL INCREASES WAGES

After the lengthy shut-down, the International Nickel Co. is anxious to secure machine men and mine workers for its plants at Sudbury and Copper Cliff, and has announced a considerable increase in wages, effective October 1st.

In order to ascertain the depth of the ore-carrying formation at Porcupine, the Hollinger Consolidated Mine is extending a vertical drill hole from their Central Shaft to a depth of possibly 6,000 feet below the surface.

GOLD AND SILVER MINES PROVE PROFITABLE INVESTMENTS

The profit disbursements of the gold and silver mines of Northern Ontario have reached a total this year, including October, of $6,635,000, divided as follows:—

GOLD MINES

Hollinger Consolidated	$2,460,000
Dome Mines Company	1,428,000
McIntyre-Porcupine	546,042
Wright-Hargreaves	206,000
Lake Shore	120,000

SILVER MINES

Nipissing	$1,080,000
Keeley	320,000
Kerr Lake	225,000
Le Rose	150,000
Coniagas	100,000
	$1,875,000

IN THE PULP AND PAPER INDUSTRY

The new machine of the Belgo-Canadian Paper Co. has also been more than living up to expectations. Though designed for a production of 80 tons of newsprint per twenty-four hours, a production of 96 tons has already been accomplished, and the machine crew have 100 tons as their objective.

An initial dividend of one and three-quarter per cent. on the preferred stock of Belgo-Canadian Paper was recently declared. It is expected that the new mill will be in full operation and giving the company an additional output of 100 tons of newsprint daily by the first of November.

The Laurentide Co., Ltd., annual report, which was recently published, shows 6.9 per cent. earned on the capital stock during the twelve-month period ended June 30, 1923, a reduction of over one million dollars in its bank loan, and an improvement in its working capital position of well over a million dollars. In view of the fact that for only half of the period under review the improved price for the company's product was in force, the report is far from disappointing.

Plans have been made public for the reorganization of the Riordon Company. According to the plans the present capitalization is to be cut by about $25,000,000, bonds and mortgages about $2,500,000 and current liabilities about $12,250,000 making a total reduction of about $40,000,000. It calls for $10,000,000 of new capital, of which $8,000,000 is understood to have been underwritten by a syndicate of banking houses.

Large Losses from Forest Fires Continue

According to Robson Black, manager of the Canadian Forestry Association, forest fires in Ontario during the past summer destroyed five to ten times the amount of timber put to use by all the mills in the Province. One company lost 500,000 cords of pulpwood due directly to the carelessness of prospectors setting fire sin the woods. Another company lost 50,000,000 feet of pine. A third Ontario firm lost in one week's fire enough pine to keep the company's mill going for 56 years.

The Hon. Esmond Harmsworth, a nephew of the late Lord Northcliffe, and a director of the syndicate of papers which was controlled by the latter, is on visit to Canada to inspect some of the mills which supply newsprint to the Northcliffe papers. He also plans to visit western Canada on a vacation trip.

Director Appointed for Paper-making School

It has been officially announced that the Quebec Government has appointed Paul Emile Piche, C.E., of Montreal, director of the new provincial paper-making school at Three Rivers.

Mr. Piche is a graduate of the Ecole Polytechnique, Montreal. He was in the employ of the Wayagamack Company for a number of years, and at the time of his appointment was head of the French division of correspondence courses in pulp and paper making which are being conducted by the Institute of Industrial and Domestic Arts, Gardenvale, P.Q. The new paper making school will be conducted in the Three Rivers Technical School, and will be a complement of that institution.

Exports of Paper Increase

Newsprint paper exported from Canada in August, 1923, amounted to 2,091,352 cwt., as compared with 1,540,081 cwt. in August, 1922. All but 24,410 cwt. of the August exports went to the United States. For the twelve months ending August Canada exported 21,788,771 cwt., valued at $80,713,487, compared with 17,325,904 cwt. and $66,200,094 for the previous twelve months. Book paper exports for the last twelve months were 48,930 cwt., compared 20,410 in the previous period. New Zealand and Australia were the principle customers. Exports of bond and writing paper increased from 10,393 cwt. for the year ending August, 1922, to 21,969 cwt. for the past year. Exports of kraft paper increased from 278,604 cwt. to 412,177 cwt., and paper board exports from $2,307,486 to $2,843,393.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Dry Insecticide and Fungicide—G. E. Sanders, 234,286, Sept. 18, 1923. CaO is hydrated with a solution of arsenic acid and mixed with dehydrated $CuSO_4$, sufficient CaO being present to take up all the free water.

Wood Distillation—E. M. Sowtelle, 233,834, Aug. 28, 1923. A descending progressively replenished mass of comminuted wood is maintained under limited, regulated combustion in the absence of introduced steam and the distillate is withdrawn through the mass into a condenser where it is fractionately condensed.

Extraction of Mercury—M. K. Codding, 233,792, Aug. 28, 1923. Hg. is extracted from sulphide ores by agitating the finely divided ore with a saline solution ($NaNO_3$ and Na_2CO_3) in the absence of reducing metals and the Hg. thus separated is recovered with the aid of a body of preformed Hg. through which the mixture of solution and ore may be passed. The latter step may be repeated as often as necessary.

Extract from Mammalian Pancreas or Related Glands—F. G. Banting, C. H. Best and J. B. Callip, 234,336, Sept. 18, 1923. A substance having the physiological characteristics of causing a reduction of blood sugar and useful for treating diabetes mellitus is prepared by treating the fresh pancreatic or related glands with a solvent capable of preserving the activity of the substance, precipitating the substance from the solution practically free from injurious adherent substances, and making a sterile solution of the substance.

Preparation Extracts From the Mammalian Pancreas and Related Glands—P. J. Maloney and D. M. Findlay, 234,337, Sept. 18, 1923. The substance of the previous patent in concentrated form and sufficiently free from impurities for repeated administration to patients is prepared by extracting the substance from the gland with a solvent, separating it from solution with $(NH_4)_2SO_4$, dissolving the latter from the substance and concentrating the substance with benzoic acid, then separating the benzoic acid and making an aqueous sterile solution of the substance.

Manufacture of Hydrogen Peroxide—E. Leriche, 234,061, Sept. 4, 1923. An alkaline persulphate is subjected to the action of steam while heated and under a partial vacuum. A solution of an alkaline bisulphate may be electrolyzed to produce the persulfate.

Method of Making Cellulose Compounds—J. C. Clancy, 234,320, Sept. 18, 1923. Cellulose nitrate is dissolved in anhydrous liquid ammonia and the dissolved nitrate is transferred into a menstruum in which the nitrate is not initially soluble. As menstruum a mixture may be used of $C_2H_2Cl_4$, CCl_4 or any of the chloraromatic compounds with an aliphatic or aromatic alcohol.

Treating Glauconite for Water Purification—H. Kriegsheim and W. Vaughan, 234,171, Sept. 11, 1923. Glauconite is fitted for use in treating water by submitting a bed of the glauconite to a plurality of alternating washings with water and a solution of NACl and removing the fine material separated by and produced in the washing. The product is composed of homogeneous clean-surfaced granules free from grayish or brownish spots and will not clog in use or give turbidity to water treated therewith.

Process for Treating Cellulose and the Formation of Cellulose Compounds—J. C. Clancy, 234,322, Sept. 18, 1923. Cellulose esters are dissolved in liquid SO_2 and the SO_2 is removed therefrom at pressure less than that which solution took place. The SO_2 is capable of more general use than the solvents heretofore used, is non-inflammable and may be readily separated from the finished product. The process is particularly applicable to the manufacture of photographic films, artificial silk, etc.

Method of Treating Cellulose and the Formation of Cellulose Compounds—J. C. Clancy, Can. 234, 321, Sept. 18, 1923. Cellulose esters are dissolved in liquid anhydrous ammonia and the solvent is substantially removed therefrom. The process is applicable to the production of photographic films which after use may be readily dissolved for the recovery of the cellulose for further use and at the same time the Ag. may be recovered.

Alcohol—W. H. Rodebush, 234,338, Sept. 18, 1923. A mixture of ethyl acetate water and alcohol containing a larger percentage of the alcohol than would be contained in a constant boiling mixture of these constituents is rectified to produce alcohol substantially free from water.

Apparatus por Producing Alcohol—W. H. Rodebush, 234,339, Sept. 18, 1923.

Absolute Alcohol—J. A. Steffens, 234,340, Sept. 18, 1923. Alcohol water and a benzol are distilled, the benzol is separated from the distillate by allowing the condensate to separate into two layers, washed and returned to the rectifier to produce absolute alcohol.

Affaratus por Obtaining Absolute Alcohol—J. A. Steffens, 234,341, Sept. 18, 1923.

Roasting Furnaces—D. Baird, 233139, July 31, 1923.

Treatment of Oxidized Ores—W. G. Perkins, 233553, August 14, 1923. Magnetic properties are given to oxidized ore particles of a desired metal by heating the ore in the presence of S and Fe (iron pyrites) in an atm. (stam) which will not re-act vigorously to rapidly remove S.

Production of Metaldehyde—T. Lichtenbahn and E. Luscher, 233,540, August 14, 1923. AcH is treated with a metal bromide such as $CaBr_2$ which is capable of splitting off H Br.

Concentration of Minerals—W. O. Borcherdt, 233601, August 14, 1923. The flotation of minerals associated with colloidal matter in a pulp, is improved by first separating the colloidal matter from the pulp by overflow or decantation and then subjecting the pulp to a flotation operation. Na_2SiO_3 is used to cause the dispersive.

Recovery of Potash and Alumina from Silicates—C. M. Brown, 233594, August 14, 1923.

Tin Plate Scrap—R. A. Holland, 233677, August 21, 1923. Tin plate is immersed in an electrolyte in electrical association with an element electro-negative thereto having a depolarizing substance in contact therewith The galvanic action causes the Sn to dissolve and it is recovered by electrolysis. Apparatus is also specified.

Manufacture of Viscose Silk—E. Bronnert 233614, August 21, 1923. In the spinning of very fine threads from viscose where the minimum concentration of H_2SO_4 is used with $(NH_4)_2$ SO_4 in accordance with the desired fineness of the threads, part of the $(NH_4)_2SO_4$ is replaced by Na_2SO_4. Relatively large apertures are used in spinning.

Production of Nitrogen and Mixtures of Nitrogen and Hydrogen—L. Casale, 233604, August 14, 1923.

Manufacture of Carbon Electrodes—I. Szarvasy, 233714, August 21, 1923. CH_4 is decomposed in an externally heated chamber to produce a mixture of soot and tarry substances which is made into electrodes.

Process for Preventing Decomposition of Hydrogen Peroxide Solutions—A. Farago, 233708, August 21, 1923. Decomposition of H_2O_2 is prevented by saturating the solution with O and bringing it under high pressure in hermetically closed vessels by means of O.

Copper Ores and Their Gangues—E. Erdos, 233728, August 21, 1923.

COMPANY NEWS

The Chemical Products, Ltd., report a net trading loss, during the year ending June 30, 1923, of $25,302. Sales for this period were $187,609.

This company has a sulphuric acid plant with a daily capacity of 120 tons, and also a plant with an annual capacity of 50,000 tons of acid phosphate.

Whalen Co. to Reorganize

The Whalen Pulp & Paper Company, who operate three large mills in British Columbia, have called in a receiver, and the company will be reorganized and re-financed. The immediate reason for this move is the catastrophe in Japan, as 50% of the product of the Whalen Co. has, for some years past, been sent to this market.

The Spanish River Pulp & Paper Mills report a most profitable year for the twelve months ending June 30, 1923, during which period the net earnings amounted to $4,008,155, an increase of $640,000 over the previous year.

Mr. Walter E. Booth, president of the Booth-Coulter Copper & Brass Co., Ltd., Toronto, has disposed of his stock in this company to the Coulter interests. The name of the company will remain the same.

The Ontario Steel Products Co., Ltd., report profits of $189,888 for the year ending June 30th, compared with $141,083 for the twelve previous months.

Asbestos Merger is Suggested

The directors of the Asbestos Corporation of Canada, Ltd., have reduced the dividend on the preferred stock from the rate of 7 per cent to 6 per cent., and on the common stock from the rate of 6 per cent. to 4 per cent. A statement by an official of the company says: "It is stated that the shipments of asbestos have shown an increase this year over last. The prices, however, have been considerably reduced, owing to the senseless competition among the Canadian companies. There has also been a falling off in the demand for the company's higher grades, due to some extent to Rhodesian competition, as well as to the unsettled condition of affairs in Europe. In addition to this, the company's production has suffered through the destruction by fire of the King's Mine mill." The statement goes on to say that the financial position of the company has in no way been impaired. The action of the directors will without doubt place the company in a stronger position than ever and will be reflected when better business conditions return. There has been talk of a merger in the asbestos field. This would be one way out of the present situation, and it is obvious that some remedy will have to be found.

Canada Cement Have Advanced Sales

From a source in close touch with the affairs of the company it is learned that the business of the Canada Cement Company thus far in the fiscal year shows sales slightly in advance of figures for the corresponding period last year. At the present time operations are at the rate of 50 per cent. of capacity, and at this rate, when the company's year ends on December 30th, the figures for the year will be little different from those shown for 1922. A dropping off in export business is reported, caused primarily by decidedly high shipping costs, as far as South America is concerned, where the United States and Danish products have been marketed below the prices asked by the Canadian company. The problem of shipping from Canada is not so much the scarcity of boats, for these are known to be plentiful, but the fact that it is almost impossible to secure return cargoes, without which shipping is out of the question. One of the best markets that Canada Cement enjoyed up to last year was Porto Rico, which was totally lost, however, with the introduction of the Fordney tariff law last year.

Fairbanks-Morse Increase Bookings

An example of the general betterment in Canadian business for the current year is contained in the fact that for the first eight months of this year the Canadian Fairbanks-Morse Co., Ltd., reports bookings increased 25 per cent. over the corresponding period of last year, while shipments are up to 23½ per cent. This company covers a wide field of production, and reports that the improvement has been general, although it is to be expected that it is in the industrial equipment field that a considerable expansion has been shown. In the agricultural field business has been good. In 1922 this company showed a net profit of $104,709, as compared with a loss of $1,425,055 in the previous year, and from present indications the present year, which ends on December 31st, will show a still further and considerable improvement.

INCREASED COAL PRODUCTION BY B.E. STEEL

The British Empire Steel Corporation, Ltd., reports its production of coal for the month of August as 552,653 tons, as compared with a production of 225,492 tons for August, 1922. The production for eight months ending August 31st, 1923, was 3,511,771 tons, compared with a production of 2,411,308 tons during the same period in 1922, or an increased production of 1,000,463 tons.

To Operate Large Battery of Coke Ovens

From unofficial sources it is learned that the British Empire Steel Corporation plans to put into operation the battery of coke ovens erected two years ago by the Koppers Corporation. These ovens, which cost several millions, have been idle since their erection, the company securing a sufficient supply of coke from the other two batteries constructed early in the war years. There are 120 ovens in operation at the B.E.S.C. plant at present, but according to present plans 80 more will be put into operation. With this extra production the company hopes to be able to supply the Onterio market with coke for domestic use, and will make an effort to enter the Ontario market and cut into the sale of anthracite coal in that part of the Dominion.

Another blast furnace is to be blown in at the Corporation's plant within the next few weeks. At present three furnaces are operating, but not since the war has the corporation operated four. It is apparent that the business with the steel company is at the present time very good, and a fairly large number of orders are on hand.

COL. MACDOUGALL RESIGNS VICE-PRESIDENCY OF STEEL CORPORATION

Col. D. H. McDougall has resigned as vice-president of the British Empire Steel Corporation. He had been associated with the companies now forming the corporation for the past twenty years, and is familiar with all units of the concern. He has filled the positions of superintendent of the Wabana Ore Mines, general manager of the Dominion Coal Co., general manager of the Dominion Steel Corporation, president of the Nova Scotia Steel and Coal Company, and vice-president of the British Empire Steel Corporation. The corporation will retain the benefit of his long experience in a consulting capacity, as he remains a member of the board of directors.

BRITISH INDUSTRIES FAIR, APRIL 28--MAY 23, 1924.

The British Industries Fair, now the largest annual fair of its kind in the world, will be held at the White City in London, Eng., April 28-May 23, 1924, and at Castle Bromwich, Birmingham, from May 12-May 23. In previous years both sections of the fair have opened during the latter part of February, but the later date was decided on for next year, owing to the fact that those overseas buyers, who usually visit the United Kingdom in the early part of the year, will in all probability delay their visit in 1924 so that they may be able to inspect both the British Industries Fair and the British Empire Exhibition, which will open about April 15th.

PUBLICATIONS OF THE NATURAL RESOURCES INTELLIGENCE SERVICE

A new catalog of publications, just issued by the Natural Resources Intelligence Service, Ottawa, shows a number of useful maps, reports and pamphlets, which that organization has prepared for the information of the investor, assistance of those engaged in commerce and industry, and guidance of the prospective settler. Economic maps illustrating progress along agricultural, commercial and industrial lines; geographic maps of Canada, also the various provinces and districts; and interesting reports based on investigations made by the Service, comprise the collection of several hundred publications, that has been published to date.

The Service is a branch of the Department of the Interior, whose function it is to provide a central bureau of information respecting Canada's natural resources—a need to which public attention has frequently been drawn. Its work embraces a very broad field, necessitating the consolidation of much data gleaned from the evidence of explorers, corporation records, scientific and technical journals, and the reports of enquiries carried on by special commissions, universities, and other agencies. As the gathering and assembling of such information is only a means towards an end, it must be put into such form as to shed light upon the practical problems of development enterprise, consequently much of the data is re-cast and transferred to standardized maps, reports and pamphlets which enable related groups of facts to be furnished with the least possible delay.

Special importance has been attached to the preparation of geographic and economic maps, as a well-designed map is the most effective method for recording many classes of information which if handled in any other manner could not be studied with the same case or effect. For instance, a series of maps will convey more quickly and clearly than fifty pages of text, a correct appreciation of the distribution of Canada's resources, the main feature of the coal situation, the problem of marketing the wheat crops of western Canada, or opportunities for establishing a new industry. As a consequence the Service publishes regularly a standard set of geographic maps, a series covering the land situation in the Prairie Provinces, Resource Maps of the Dominion and numerous publications along similar lines, as set out clearly in the catalog of publications just issued.

THE CANADIAN TRADE INDEX

Canadian Trade Index, 1923-24. Published by Canadian Manufacturers' Association, Toronto. Price, $6.00.

This is probably the best index available of Canadian manufacturers and their products. Advertising matter is well classified, and makes instructive reading. There is an alphabetical list of Canadian manufacturers. One section is devoted to classified lists of those making certain products. The items covered are very extensive. There is also a French index of all items mentioned. The book will be very useful at home and abroad. This is a complete revision of previous editions.

BACK RIVER POWER DEVELOPMENT

It was recently announced that the final terms of the agreement between the City of Montreal and the Back River Power Co. for the necessary protection to sewer outlets on the Riviere des Prairies, as well as streets abutting on the river, had been completed, so as to enable the company to proceed with the construction of a power dam below Cedar Island which is to develop 50,000 horse power.

DIRECTOR OF CHEMICAL CO. KILLED

Mr. Carl Ide, a director of Salts & Chemicals, Ltd., Kitchener, Ont., was shot dead by some unknown person, at Dana, Sask., where the company is erecting a million-dollar plant.

REPORTS RECEIVED

MANUFACTURES OF THE NON-FERROUS METALS IN CANADA, 1921—This report issued by the Dominion Bureau of Statistics, Ottawa, covers the industries engaged in manufacturing products in which the principal materials used were metals other than iron and steel. There were 344 such plants, including eight making aluminium ware, eighty-one making brass and copper products, nineteen producing lead, tin and zinc products, 118 making precious metal products, 100 in the electrical apparatus and supplies group, and eighteen plants making miscellaneous non-ferrous metal goods, principally lantern burners and weather strip. The year 1921 was a year of depression and the value of the output of the non-ferrous industries fell off to $72,590,000 as compared with $101,290,000 in 1920. The report of eighteen pages gives summary production tables for each group of the industry.

COMPANY NEWS

Dwight P. Robinson & Co., Dominion Express Bldg., Montreal, is putting out a little house-organ, "The News," which contains very interesting descriptions and views of work they have in hand. A recent issue gave good details of the plant equipment supplied for a large sulphur pumping works, erected to operate by the Frasch method. Irrigation work in Brazil is also described. This company contracts for any type of building and plant construction, and the reviews of their work are instructive to those interested in plant design.

LEARN COST OF CASEIN PRODUCTION

Only eighteen producers of casein responded to the questionnaire of the United States Tariff Commission regarding the cost of production. About 74 American manufacturers were asked to give the information desired. Exclusive of the cost of skimmed milk, but including all other charges, the weighted average cost of casein of domestic production is $0.0547 per pound laid down in New York; 42½ per cent. of the production is below this average cost, it is stated. The 75 per cent. bulkline cost is $0.0610, and the 85 per cent. bulkline cost, $0.0802.

Domestic production during the first quarter of 1923 was 2,082,000 pounds, which was 18 per cent. of consumption. The total consumption is given as 11,276,000 pounds during the first quarter of the year, while imports increased from 9,194,182 pounds during the first quarter to 9,590,457 pounds in the second quarter. Since 1915 the summary shows the domestic production of casein has decreased from an average of slightly less than half to one-third of the domestic consumption.

Sugar of milk and milk albumen were recovered as joint products in the manufacture of casein by about seven concerns in the United States last year.—"Drug and Chemical Markets (New York)."

CANADIAN STEEL PRODUCTION INCREASES

The tonnage of steel ingots and castings produced in Canada during the month of August, namely, 105,056 long tons, was the highest for any month during the present calendar year and was 43 per cent. over the total for the previous month. It was the greatest since November, 1920, when about 110,000 tons were produced. Practically the whole of the increase was in the manufacture of basic open hearth steel ingots. For this item the production rose to 100,817 tons, an increase of 45 per cent. over the July figure.

The output of steel castings was 4,239 tons, as compared with 3,810 tons for July. Basic open hearth castings showed a small improvement, while bessemer and electric castngs declined slightly. Acid open hearth steel castings advanced to 523 tons, an increase of 221 per cent. over July, when 163 tons was produced.

ENORMOUS SUPPLIES OF MANGANESE LOST BY WASTEFUL METHODS

Wasteful methods in the washing of manganese ores, produced in the Kutais district in the Caucasus, are depriving the world of enormous supplies of this material, according to a statement made to the Institute of Politics, meeting at Williams College, Williamstown, Mass., by C. E. Julihn, representing the Department of the Interior, U.S.A. Such waste is of international interest, Mr. Julihn emphasizes, because of the relatively small reserves of high-grade manganese known to exist and the importance of such ores in the manufacture of steel.

A study of the preparation of the Kutais ores, made by J. W. Furness, associate mining engineer of the United States Bureau of Mines, develops the fact that the tremendous wastes now occurring are due to the desire to meet an unreasonable and unnecessary trade requirement calling for manganese of fifty-two per cent. grade. An annual production of approximately a million tons of ore containing fifty-two per cent. manganese is made from the Kutais deposits by washing ore which averages forty-seven per cent. of the original manganese. This means in effect that, in order to make an improvement of five per cent. in grade, about one-half the manganese mined is lost in washing.

The Bureau of Mines investigation developed that about twenty per cent. of the production from these deposits is marketed in the United States, forty per cent. in Great Britain, and the remainder in France, Germany and Italy. To these countries, which are the great steel producers, the conservation of high-grade manganese is especially important.

It was pointed out by Mr. Julihn that there are no established international agencies authorized to consider such unwarranted wastes of the world's precious natural resources. The consumers, he declared, are most concerned with obtaining the highest possible grade of material without thought or responsibility as to the future of world industry. It is hoped that the calling of attention to these serious manganese losses may lead to some means of remedying the situation and thereby establish a precedent for the correction of other unsound international trade practices.

CHEMICAL EXPOSITION TO BE HELD BIENNIALLY

The Chemical Exposition will not be held in 1924, according to a recent vote taken among the exhibitors by the management. The results of a mail vote on the question of whether the Exposition should be held every year or every other year ended on July 28th and showed about sixty per cent. of exhibitors voting were in favor of a biennial exposition. The vote by mail was taken by the management as a result of the meeting of exhibitors held at Chemists' Club, New York, on July 28th, at which time a vote on the question by those present resulted in a tie. It was then decided that all exhibitors should vote again by mail and that this should be considered the final decision in the matter. Following the 1923 Chemical Exposition, which was held during the week of September 17th to 22nd at the Grand Central Palace, New York, the next Exposition will be held in 1925 by the same management.

SUGAR EXPORTS DECREASE

The exports of Canadian refined sugar show a considerable decrease for the month of August. During this month, exports amounted to only 660,419 lbs., compared with 8,943,220 lbs. in July, and 30,056,955 lbs. during August of last year.

Dr. Stewart, geologist for the Imperial Oil Co., reports favorably on the possibilities of obtaining oil in commercial quantities from the oil field near Medicine Hat and Many Islands, Alta.

REPORT ON ROUYN TOWNSHIP AND VICINITY

The report of the Geological Survey of Canada presenting the results of field investigations carried on during the summer of 1922 on the geology and gold deposits of north-western Quebec is now available for distribution. It is accompanied by two geological maps published on a scale of one mile to one inch. It is published in the Summary Report of the Geological Survey for 1922, Part D. This part of the Summary Report also contains reports on the palladium-bearing nickel deposit at Shebandowan Lake, Ontario, on the gold occurrence at Makwa, Ontario, and on certain peat bogs of Quebec. Copies may be had by applying to the Director, Geological Survey, Ottawa.

"WHERE TO BUY" EVERYTHING CHEMICAL

The July, 1923 edition of "Where to Buy Everything Chemical," published by S. Davis, 30 St. Swithins Lane, London, E.C. 4, shows a steady increase in size and in the number and arrangement of the various headings. The division of the book into the three sections, general chemicals, fine chemicals and plant, has been found very advantageous. It is published twice yearly, January and July, price 2s. 6d, post free. The complete address of each company is given, also telegraphic address, and the whole book is a very complete guide to the chemical industry of the United Kingdom. The technical editor is Mr. C. J. Goodwin, B.Sc., M.I. Chem. E.

IMPORTANT GYPSUM DEPOSIT DISCOVERED

The Ontario Department of Lands and Forests report the discovery of an important bed of gypsum, along a small river tributary to the Moose, between Cochrane and James Bay. Analyses show a purity of 99.8% over the whole bed. The only other gypsum deposit, comparable in size and purity to this newly-discovered bed, is in Austria.

FORTY-TWO CARS OF NEWSPRINT

Forty-two railway cars, loaded with newsprint for Canadian and United States papers, recently reached Toronto from Iroquois Falls, Ont.

PERSONAL

Nelson Littell, formerly second assistant examiner in the United States Patent Office, has resigned to engage in the practice of patent law, specializing in metallurgical and chemical patents with offices at 110 East 42nd Street, New York.

Dr. H. M. Tory, president of the University of Alberta, Edmonton, has declined the offer recently made him to take the chairmanship of the Canadian Scientific Research Council, in order to retain his present position at the University.

During 1922, the shipments of all grades of Canadian gypsum amounted to 559,265 tons, valued at $2,160,898, an increase of 172,715 over those of 1921.

Ontario produced 97.2% of Canada's production of salt during 1922, which amounted to 183,438 tons, valued at $1,628,323.

MALT PRODUCTS CO. SUFFER FIRE LOSS

A building, and the stock therein, belonging to the Malt Products Co. of Canada, Guelph, Ont., was recently damaged by fire to the extent of $25,000.

Two men lost their lives when the bottom of a furnace at the plant of the Abrasive Co. of Canada, Ltd., Hamilton, Ont., collapsed recently.

Chemical, Oil and Metal Markets

CHEMICALS

Trading in chemicals both at American and Canadian points revived somewhat during the last week in September but is still not up to expectations. Competition is remarkably keen in many lines with import offerings rather disturbing at times to domestic quotations. Heavy chemicals are, however, an exception, and the heavy acids and alkalis are holding steady with a fair amount of business.

October has every indication of proving a good month in chemicals, and while the volume of business has so far not been as large as was expected, yet enquiries are more numerous and there is every indication that some really good business will be placed during October.

Imported material is undoubtedly becoming an important factor on the Canadian market in nearly all lines except the heavy acids and alkalis. For example, magnesium sulphate was recently offered at Toronto at $26 per ton, but such a low price cannot be said to be the market price as $30 per ton would be a very reasonable quotation on the technical grade. Indeed some producers refuse to sell their grade at even that figure.

Some Declines—The following have declined the amount stated: citric acid 5c per lb.; salicylic acid, 2c per lb.; stearic acid, 2c per lb.; carbon tetrachloride, 2c per lb.; formaldehyde, 1½c per lb.; lithopone, ½c per lb.; potassium bicarbonate, 1c per lb.; caustic potash, drums, 1c per lb.; zinc oxide, 1c per lb.; carbolic acid, crystals, 5c per lb.; pot. bromide, 2c per lb.; saccharine, 25c per lb.

Advances have occurred in acetone alcohol which is now quoted at $1.75 per gal. in bbls. or over; borax, crystals, are stronger by ¼c per lb., while all grades of glycerine have advanced 1c per lb. No. 1 grade, talc, has also advanced $3 per ton and is now quoted at $33.00.

So far as the consuming industries go, some revival in buying is noted from the rubber mills. The tanneries, steel, and soap works continue to buy in fair proportion, but the textile industry has been slow.

THE BRITISH MARKET

(From our London correspondent)

The prices of the heavier chemicals have been well maintained, the most noteworthy exception being a reduction of £2 per ton in the manufacturer's prices for caustic soda, which now range from £17 to £19 10s. 0d. per ton according to quality. Business in ammonia alkali and soda ash has been fairly good; the efforts of British makers to dominate the Japanese market in soda ash and similar products have been successful, and this branch of the industry will therefore suffer considerably from the effects of the disaster in the Far East.

The high prices which have for a long time been prevalent for white arsenic have not stimulated the Cornish production, which remains at less than 2,000 tons per annum, as in pre-war days, output depending upon the condition of tin-mining, which is seriously depressed.

CURRENT CANADIAN MARKET QUOTATIONS ON CHEMICALS, GUMS, OILS AND METALS.

GENERAL CHEMICALS

Acetaldehyde, 99%, carlots, 20,000 lbs. and over	lb.	.15	—
Less than carlots	lb.	.16	—
Both quotations f.o.b. Shawinigan Falls, Que.			
Acetone, pure, drums or over	lb.		— .34
Lesser amounts	lb.		— .40
ACID—			
Acetic, 28%, car. lots	100 lbs.		— 5.05
28%, 25 bbl. lots	100 lbs.		— 5.30
28%, 10 bbl. lots	100 lbs.		— 5.55
28%, 5 bbl. lots	100 lbs.		— 5.80
28%, 1 or 2 bbl. lots	100 lbs.		— 6.05
80%, carload lots	100 lbs.		—14.00
80%, 25 bbl. lots	100 lbs.		—16.00
80%, 15 bbl. lots	100 lbs.		—17.00
80%, 10 bbl. lots	100 lbs.		—17.25
80%, 5 bbl. lots	100 lbs.		—17.75
80%, 3 or 4 bbl. lots	100 lbs.		—18.75
80%, 1 or 2 bbl. lots	100 lbs.		—19.00
Glacial, bbls.	lb.		— .12
Carboys	lb.		— .12½
Boric, crystals, bbls	lb.		— .13
Boric, powder, bbls	lb.		— .12½
Benzoic	lb.	.85	— .90
Butyric, 98-99% pure, f.o.b. Shawinigan Falls	lb.	1.00	—
Citric, kegs	lb.	.50	— .55
Formic, 75%, carboys, 100 lbs.	lb.	.20	— .21
Gallic, tech	lb.	.50	— .55
Gallic, B. P.	lb.	1.25	— 1.50
Hydrochloric, 18°, carboys, 100 lbs.	lb.	2.25	— 2.75
Hydrofluoric, 60%	lb.	.22	— .25
Hydrofluoric, 30%	lb.	.11	— .13
Lactic 44%, tech., light, bbl.	lb.		—
Lactic 22%, tech., light, bbl.	lb.		—
Muriatic, see acid hydrochloric.			
Nitric, 36°, carboys	100 lbs.	8.25	— 9.00
Oleic	lb.		— .26
Oxalic	lb.	.11	— .13
Phosphoric, 85%	lb.		— .28
Phosphoric, 50%	lb.		— .22
Pyrogallic, resublimed	lb.	2.00	— 2.10
Salicylic, tech., bbl	lb.	.47	— .48
Salicylic, B.P. bbl	lb.	.47	— .50
Sulphuric, 66°, carboys	100 lbs.	2.25	— 2.75
Sulphuric, 66°, tank cars, f.o.b. works	ton	19.00	—20.00
Stearic, double pressed	lb.	.20	— .22
Stearic, triple pressed	lb.	.23	— .24
Tannic, B.P.	lb.	.80	— .90
Tannic, tech	lb.	.45	— .55
Tartaric, crystals, bbls	lb.	.35	— .40
Tartaric, powder, bbls	lb.	.36	— .42
ALCOHOL, absolute Ethyl, case of 1 doz. 1 lb. bottle			— 3.15
In steel drums of 10 gals. capacity	Imp. gal.		—23.00
Acetone, bbls. or over	gal.		— 1.75
Lesser amounts	gal.		— 2.00
Aldehyde Ammonia	lb.		— .75
Alum, Ammonia, lump or ground	100 lbs.	3.75	— 4.50
Aluminium Sulphate, lump bags	100 lbs.	2.25	— 2.50
Ground, bags	100 lbs.	2.50	— 2.75
Iron, free	100 lbs.		— 4.00
Ammonia, aqua, 26°, carboys	lb.	.13	— .14
Drums	lb.		— .09½
AMMONIUM, Carbonate	lb.	.12	— .15
Chloride	lb.	.10	— .13
Amyl Acetate, tech	gal.		— 4.00
Pure	lb.		— .80
Arsenic, white	lb.	.13½	— .15
BARIUM, Sulphate, B.P.	ton		—60.00
Chloride	lb.	.06	— .08
Nitrate	lb.		— .16
Peroxide	lb.		— .26
Blanc fixe, dry, bbl	lb.		— .04½
Pulp, bbl	ton		—
Bleaching Powd., 35%, drums	lb.	2.50	— 3.00
Borax, crystals	lb.	.05¾	— .06
Bromine, tech	lb.		— .38
Benzaldehyde	lb.	1.35	— 1.60
Butylaldehyde	lb.	.60	—
CALCIUM ACID, Phosphate	lb.		— .07½
Carbide, ton lots, f.o.b. wks.	ton		—95.00
Carbide, less than ton lots	ton		—100.00
Chloride, fused	ton		—35.00
Chloride, flake	ton	48.00	—50.00
CAUSTIC SODA, flake, drms.	100 lbs.	5.00	— 5.50
Ground, drums	100 lbs.	5.00	— 5.50
Solid, drums	larger	4.25	— 4.75
CARBON BISULPHIDE, drums	lb.	.10	— .12
Tetrachloride, drums	lb.		— .16
Chlorine, liquid, in cylinders of 150 lbs.	lb.	.09½	— .10½
Cobalt Oxide, black	lb.		— 2.00
Grey	lb.		— 2.25
Copperas, crystals	lb.	.02	— .02½
Sugar	lb.	.02	— .02½
Copper Sulphate (blue vitriol)	lb.	.07½	— .08
Corrosive Sublimate	lb.	1.00	— 1.50
Cyanide, Crude	lb.		— .22
Dextrine, potato	lb.		— .06
Corn	lb.		— .08½
ETHER, B.P. (conc.)	lb.		— .55
Sulphuric	lb.		— .25
Ferric Chloride, crystals	lb.	.08	— .08½
Solution	lb.		— .06
Formaldehyde, bbls. or over	lb.		— .17
200-lb. kegs	lb.		— .18½
100-lb. kegs	lb.		— .19
50-lb. kegs	lb.		— .19½
Fullers' Earth, powder	100 lbs.	2.00	— 2.50
Car lots, f.o.b. Toronto	ton		—30.00
Fusel Oil, special, refined	gal.	4.00	— 4.50
Glycerine, crude, drums	lb.		— .15
Crude, single tin of 56 lb.	lb.		— .17
C.P., single tin of 56 lbs.	lb.		— .28½
C.P., two or more tins	lb.		— .26½
C.P. drums, 500-1,000 lbs.	lb.		— .20½
Pale straw, drums, 500-1,000 lbs.	lb.		— .19½
Pale straw, single tin 56 lb.	lb.		— .27½
Pale Straw, 2 or more tins.	lb.		— .25½
Hexamethylene Tetramine	lb.	.90	— .95
Hydrogen Peroxide	gal.		— .75
Iron Oxide, red, casks	lb.	.13	— .20
LEAD, Acetate	lb.	.14	— .16
Nitrate	lb.	.14	— .15
Lime, grey	ton		—14.30
Grey, in car lots	ton		—11.70
Hydrated, in ton lots	ton		—20.00
Litharge	lb.	.09	— .10
Lithopone	lb.	.06½	— .07
Magnesite, Calcined	ton		—30.00
Clinkered	ton		—35.00
Raw	ton		—10.00
MAGNESIUM, Carbonate, bbls.	lb.	.14	— .16
Sulphate, B.P.	cwt.	2.50	— 2.60
Technical, car lots	ton		—30.00
Methyl Hydrate (wood Alcohol), 95%, bbls. or over	gal.		— 1.10
95%, half-bbl. lots	gal.		— 1.30
95%, lesser amounts	gal.		— 1.35
97%, bbls	gal.		— 1.10
97%, half-bbl. lots	gal.		— 1.30
97%, lesser amounts	gal.		— 1.35
Nickel Salt, single, in bbl. lots.	lb.		— .13½
Single, per cwt	lb.		— .15
Double, barrel lots	lb.		— .14
Double, per cwt	lb.		— .15½
Phosphorus, yellow	lb.		— .34
Potash Prussiate, yellow	lb.	.33	— .36
POTASSIUM, Bicarbonate	lb.		— .19
Bichromate	lb.	.15	— .16
Carbonate, calc. 80-85%	lb.		— .14
Chlorate	lb.		— .12
Citrate	lb.	.90	— 1.00
Hydroxide (caust. potash)sticks			— .40
Hydroxide (caustic potash), small drums	lb.	.12	— .14
Hydroxide (caustic potash) large drums	lb.	.10	— .11
Nitrate, casks	lb.	.08½	— .09
Permanganate, bulk	lb.	.19	— .20
Red Precipitate (mercuric ox.)	lb.		— 1.75
Silver Nitrate	lb.		— 9.00
Soda Ash, bags	cwt.	2.25	— 2.40
SODIUM, Acetate, ton lots or ov.	lb.		— .06
Lesser amounts	lb.		— .06½
Aluminium Phosphate	lb.		— .03½
Benzoate	lb.		— .70
Bicarbonate, 100% pure	lb.	2.50	— 3.00
Bichromate, bbls	lb.	.10	— .13
Bisulphite, powder	lb.	.05½	— .06
Bisulphite, 35 Be	lb.	.03	— .03½
Bromide (foreign)	lb.	.20	— .22
Cyanide, bulk, 98-99%, in cases	lb.		— .34
Fluoride, 95-98%	lb.	.15	— .16
Hyposulphite, kegs	100 lbs.	4.75	— 5.00
Barrels	cwt.	4.00	— 4.50
Iodide	lb.		— 5.20
Nitrate, refined	cwt.	6.75	— 7.00
Crude, 95%	cwt.	5.25	— 5.75
Nitrite	lb.	.12	— .15
Perborate, U.S.P.	lb.	.35	— .40
Peroxide, f.o.b. New York	lb.	.25	— .27
Silicate, 42°, car lots	cwt.		— 1.35
Smaller lots	cwt.		— 1.55
Silicate, 40°, car lots	cwt.		— 1.25
smaller lots	cwt.		— 1.45
Sulphide, 60-62% fused, drums car lots	lb.	.05	— .05½
Sulphate (Glauber's Salts), crystals, in bags	cwt.	1.80	— 2.00
Car lots	cwt.	1.65	— 1.75
Sulphite	lb.		— .02
Prussiate, yellow	lb.	.14	— .16
Sulphur, ground	100 lbs.	2.50	— 2.75
Roll	100 lbs.	4.25	— 4.75
Talc, No. 1 grade	ton		—33.00
No. 2 grade	ton		—25.00
No. 3 grade	ton		—21.00
Tin Chloride, crystals	lb.	.30	— .35
Tri-Sodium Phosphate	lb.	.07	— .07½
Ultramarine, blue	lb.	.10	— .29
White Precipitate (mercuric-Ammonium chloride)	lb.	1.90	— 2.00
Whiting (English)	ton	28.00	—30.00
(American)	ton	22.00	—25.00
ZINC, Sulphate, com	lb.	.05	— .05½
Dust	lb.	.13	— .14½
Oxide, lead free	lb.	.10	— .11
Stearerate	lb.	.30	— .35

PHARMACEUTICAL CHEMICALS

AMMONIA, Aqua, C.P.	lb.		— .22
Iodide	lb.		— 6.25
Asperin, 100 lb. lots, bulk	lb.		— .95
Caffeine, English	lb.		— 3.50
Calomel (mercurous chloride	lb.	1.30	— 1.50
Camphor, Monobromate	lb.		— 2.60
Refined, slabs	lb.		— 1.30
Refined, Tab	lb.		— 1.40
Carbolic Acid, white crystals.	lb.	.40	— .45
Chloroform	lb.	.40	— .45
Coumarin	lb.	3.75	— 4.00
Cream Tartar, 98%	lb.	.25	— .30

Ether, B.P.	lb.	—	.55
Iodine, crude	lb.	4.50 —	4.75
Resublimed	lb.	5.50 —	5.60
Lithium Carbonate	lb.	1.80 —	2.10
Potassium Bromide, crystals	lb.	.18 —	.20
Granular	lb.	.18 —	.20
Iodide	lb.	—	4.50
Phenacetin	lb.	2.00 —	2.35
Phenolphthalein	lb.	—	1.75
Quinine	oz.	.55 —	.60
Saccharin	lb.	—	1.50

SYNTHETICS

Benzyl, Acetate	lb.	—	1.75
Benzoate	lh.	—	1.75
Citral	lb.	—	4.50
Coumarine	lb.	—	3.75
Heliotropine	lb.	—	3.00
Linalyl Acetate	lb.	—13.	50
Methyl Salicylate	lb.	—	.50
Musk, Xylol	lb.	—	3.00
Teyseniol	lb.	—	1.00

ESSENTIAL OILS

Anise	lb.	—	.80
Bay	lb.	—	3.00
Bergamot	lb.	—	4.50
Cajaput	lb.	—	1.25
Camphor, white	lb.	—	.50
Brown	lb.	—	.25
Cassia	lb.	—	2.00
Cedar Leaf	lb.	1.90 —	2.00
Cedar Wood	lb.	—	.50
Citronella, Ceylon	lb.	—	.60
Java	lb.	—	.85
Clove	lb.	—	2.25
Eucalyptus	lb.	—	.65
Geranium Bourbon	lb.	—	7.50
Lavender	lb.	—	5.00
Spike	lb.	—	1.25
Lemon	lb.	—	.75
Lemongrass	lb.	—	1.35
Lime, distilled	lb.	—	1.00
Orange Sweet, Sicilian	lb.	—	3.50
West Indian	lh.	—	3.00
Peppermint, American	lb.	—	3.50
Japanese	lb.	1.75 —	2.00
Redistilled, B.P.	lb.	4.00 —	4.25
Patchouli	lb.	—10.	00
Otto of Rose	oz.	—	6.50
Rosemary	lb.	—	.65
Sandalwood	lb.	—	7.50
Sassafras	lb.	—	1.75
Thyme	lb.	—	1.45

VEGETABLE OILS

Castor Oil, No. 3, bbl	lb.	.16½ —	.17½
No. 1, bbl	lb.	.18 —	
Chinawood Oil	lb.	—	.27
Cocoanut, Ceylon, bbl	lb.	—	.11
Cochin, bbl	lb.	—	.12½
Corn Oil, bbls	lb.	—	.12
Tank cars	lb.	.09¾ —	.10
Cottonseed Oil, crude, f.o.b. U. S. mills, tanks	lb.	.10 —	.10⅛
Summer, yellow, bbl	lb.	—	.11½
Winter, yellow, bbl	lb.	—	.13¾
Linseed Oil, 1 to 2 bbls., Raw, per gal. of 9 lbs		—	1.17
3 to 5 bbls., Raw, per gal. of 9 lbs		—	1.16
6 to 9 bbls., Raw, per gal. of 9 lbs		—	1.14
Boiled Linseed Oil, 3c. per gal. higher than raw			
Monopole Oil	lb.	.07 —	.16
Olive Oil, foots	lb.	.10 —	.11

GUMS

Arabic, clear amber sorts	lb.	—	.20
Regular grain No. 4 and No. 5	lb.	—	.28
Regular grain No. 2	lb.	—	.31
White sorts	lb.	—	.35
Powdered, No. 1	lb.	—	.40
Powdered, No. 2	lb.	—	.39
Indian, No. 1A	lb.	—	.28
No. 1	lb.	—	.25
Tragacanth, No. 1, ribbon	lb.	—	3.00
No. 1, flake	lb.	—	2.00
Turkey	lb.	—	2.00

VARNISH RESINS

Congo, sorts	lb.	.10 —	.11
Hard amber	lb.	.11½ —	.18
White	lb.	.35 —	.45
Damar, Batavia	lb.	.35 —	.38
Singapore, No. 1	lh.	.39 —	.45
Singapore, No. 2	lb.	.20 —	.24
Singapore, No. 3	lb.	.09½ —	.12
East India, pale bold	lb.	.22 —	.25
Pale nubs	lb.	.15 —	.17
Pale chips	lb.	.07 —	.12
Black bold	lb.	.09 —	.12
Black nubs and chips	lb.	.05 —	.08
Kauri, XXXXX	lb.	1.60 —	
XXXX	lb.	1.25 —	
XXX	lb.	1.10 —	
XX	lb.	.90 —	
X	lb.	.80 —	
No. 1	lb.	.67 —	.70
No. 2	lb.	.45 —	.50
No. 3	lb.	.25 —	.30
B. X	lb.	.55 —	.65
B. 2	lb.	.30 —	.35
No. 1 chips	lb.	.22 —	.27
Brown chips	lb.	.15 —	.20
Dust	lb.	.10 —	.15
Manila, Bold XXXXX	lb.	.21 —	.23
Nubs, pale	lb.	.18 —	.22
Nubs, amber	lb.	.10 —	.18
Soluble A	lb.	.16 —	.18
Soluble chips	lb.	.10 —	.12
Pontianac Bold	lb.	.20 —	.30
Genuine nubs	lb.	.14 —	.17
Genuine chips	lb.	.10 —	.12

WAXES

Bayberry	lb.	.35 —	.38
Beeswax, white, pure	lb.	—	.38
African	lb.	—	.26
Brazilian	lb.	—	.34
Chilean	lb.	—	.35
Refined	lb.	—	.31
Candelilla	lb.	.40 —	.42
Carnauba, No. 1, bags	lb.	—	.50
No. 2, North Country	lb.	—	.32
No. 3, North Country	lb.	—	.22
No. 3, chalky	lb.	—	.21
Ceresin, white	lb.	—	.12½
Yellow	lb.	—	.12
Japan	lb.	.19 —	.20
Montan, crude	lb.	.06 —	.07
Ozokerite, crude, brown	lb.	.16 —	.17
Black, 158°—160°, M.P.	lb.	.18 —	.19
Paraffin, 128°—130°, M.P., 250 lb. lots	lb.	—	.06
118°—120°, M.P., 250 lb. lots	lb.	—	.05
Parowax, blocks, 100 lb. lots	lb.	—	.08½

SHELLAC

T.N.	lb.	—	.80
Superfine Orange	lb.	—	.85
A. C. Garnet	lb.	—	.78
Bone Dry	lb.	—	.86

NAVAL STORES, FLOTATION OILS

Pine Tar Oil, crude	gal.	—	.60
Refined	gal.	—	.65
Rosin, G., 280 lb. bbl. lots	bbl.	7.00—	7.50
W.W., 280 lb. bbl. lots	bbl.	8.95—	9.25
Turpentine, 1 bbl. lots	Imp. gal.	—	1.40
2 to 4 bbl. lots	Imp. gal.	—	1.38
Less than bbl. lots	Imp. gal.	—	1.45

PETROLEUM OILS AND DISTILLATES

Mid-Continent Crude, 42 W. gal.	bbl.	—	1.45
Pennsylvania Crude, 42 W. gal	bbl.	—	2.75
Coal Oil	gal.	—	.19
Fuel Oil, bbls	gal.	—	.10.7
Tank cars	gal.	—	.08.7
Gasoline, motor	gal.	—	.24
Service stations	gal.	—	.28
Gasoline, lighting	gal.	—	.30
Naphtha	gal.	—	.24

COAL TAR PRODUCTS

Alpha—Naphthylamin	lb.	.46 —	.48
Benzol, 100%	Imp. gal.	—	.55
90%	Imp. gal.	—	.50
Carbolic Acid, crude, 25%	gal.	—	.44
Creosote Oil, crude	gal.	—	.40
Refined	gal.	—	.60
Coal Tar, crude	bbl.	—10.	25
Refined	bbl.	—11.	50
Coal Tar Pitch, bbls	cwt.	—	2.00
Cresol, U.S.P., f.o.b. N.Y.	lb.	—	.36
Dip Oil, 25%, f.o.b. N.Y.	gal.	.25 —	.30
H. Acid, f.o.b N.Y.	lb.	.75 —	.80
Phenol, drums	lb.	.60 —	.65
Pyridine, f.o.b. N.Y.	gal.	4.00 —	4.25
Resorcinol, tech, f.o.b. N.Y.	lb.	1.35 —	1.50
Pure, f.o.b. N.Y.	lb.	2.25 —	2.35
Naphthalin, flake	lb.	—	.07
Balls	lb.	—	.08
Solvent Naphtha, refined	gal.	—	.48
Toluol, pure	gal.	—	.54
Xylene, pure, f.o.b. N.Y.	gal.	.65 —	.70
Comm., drums, f.o.b. New York	gal.	—	.34

FERTILIZER MATERIALS

Acid Phosphate	ton	$28.00—	30.00
Animal Tankage, per unit of ammonia		—	3.50
Per unit of bone phosphate of lime		—	.10
Nitrate of Sode		70.00 —	75.00
Muriate of Potash	ton	—	40.00
Pure Ground Blood, per unit of ammonia		—	4.00
Steamed Bone Meal	ton	—	50.00
Sulphate of Ammonia	ton	68.00 —	70.00

TANNING AND DYEING MATERIAL

Chestnut Liquid Extract	lb.	.02½ —	.03½
Fustic Crystals	lb.	.24 —	.28
Ground Sumac	ton	70.00 —	75.00
Hematine Crystals	lb.	.18 —	.22
Hemlock Liquid Extract	lb.	.03½ —	.04
Liquid Sumac Extract	lb.	.06½ —	.07½
Logwood, Solid	lb.	.16 —	.19
Quebracho Liquid Extract	lb.	.03½ —	.04
Quercitron Liquid Extract	lb.	.07 —	.08

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The following quotations on Rubber are in American funds, New York delivery:—

Para, upriver fine	lb. $	—	.26¾
Upriver, coarse	lb.	—	.24
Caucho ball	lb.	—	.25
Plantation, 1st latex crepe	lb.	—	.27
Ribbed smoked sheets	lb.	—	.27
Brown crepe, thin, clean	lb.	—	.25½
Amber crepe, No. 1	lb.	—	.26½

MISCELLANEOUS MATERIAL

Asbestos, crude, No. 1, f.o.b. Quebec	ton	375.00 —	475.00
Shingle, f.o.b. Quebec	ton	55.00 —	60.00
Cement, f.o.b. Quebec	ton	21.00 —	25.00
Barytes, floated	ton	30.00 —	36.00
Crude, f.o.b. mines	ton	9.00 —	10.00
Casein, tech., bbls	lb.	.28 —	.30
China Clay, f.o.b. Huberdean, Que., car lots	ton	17.00 —	18.00
Imported	ton	20.00 —	23.00
Feldspar, No. 1, f.o.b. mill	ton	—	22.00
Firebrick, Scotch, depending on grade	M.	70.00 —	80.00
American, depending on grade	M.	75.00 —	90.00
Fluorspar, ground	ton	25.00 —	28.00
Graphite, crude high grade	ton	30.00 —	35.00
Ceylon, lump	lb.	.06 —	.06½

INDUSTRIAL GASES

Acetylene, cylinders	100 cu. ft.	$2.55 —	3.00
Coal Gas, cylinders	100 cu. ft.	3.00 —	4.00
Hydrogen, cylinders	100 cu. ft.	1.50 —	2.00
Nitrogen, cylinders	100 cu. ft.	2.00 —	3.00
Oxygen, cylinders	100 cu. ft.	1.50 —	2.00

METALS

Aluminium, 98-99%, 15 ton lots	lb.	—	.24
Antimony	lb.	—	.08
Brass, yellow ingots	lb.	—	.12
Red	lb.	—	.16½
Rods	lb.	—	.19
Cobalt	lb.	3.00 —	3.25
Copper electrolytic, small lots	cwt.	—	15.50
Car lots	cwt.	—	15.00
Casting, small lots	cwt.	—	14 50
Casting, car lots	cwt.	—	14.00
Gold, pure	oz.	23.00 —	25.00
Iron, pig	ton	—	31.50
Bar iron, base	cwt.	—	3.75
Lead, pig, small lots	cwt.	—	7.60
Car lots	cwt.	—	7.10
Magnesium, ribbon	oz.	—	1.50
Ribbon	lb.	—	18.00
Powder	oz.	.60 —	.65
Monel Metal, machined rods	lb.	—	.50
Blocks	lb.	—	.34
Shot	lb.	—	.34
Sheet, hot rolled, on orders of over 500 pounds, of one gauge	lb.	—	.48
rods, hot rolled	lb.	—	.42
Rods, cold rolled	lb.	—	.53
Nickel, shot or ingot	lb.	—	.35
Platinum, pure	oz.	—	124.00
5% iridium	oz.	—	128.00
10% iridium	oz.	—	138.00
Silver, bar, American silver	oz.	—	.99½
Bar, Canadian produced, U.S. funds	oz.	—	.64½
Steel, mild, ¼-inch, base price	cwt.	3.75 —	3.90
3/16-inch, base price	cwt.	4.25 —	4.50
Black sheet, 28 gauge, size 30"	cwt.	—	5.55
Black sheet, 28 gauge, size 36"	cwt.	—	5.65
Sheets, galvanized, 28 gauge, 30"	cwt.	—	6.75
Sheets, galvanized, 28 gauge, 36"	cwt.	6.85 —	6.90
Blue sheets, base	cwt.	4.50 —	4.60
Tin	lb.	—	.47
Zinc, sheets	lb.	—	.15
Zinc, (spelter), small lots	cwt.	—	8.30
Car lots	cwt.	—	7.80

2

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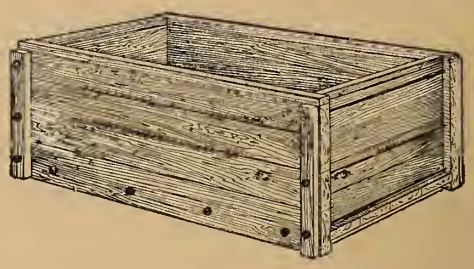

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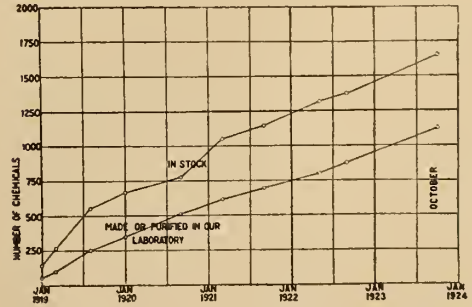

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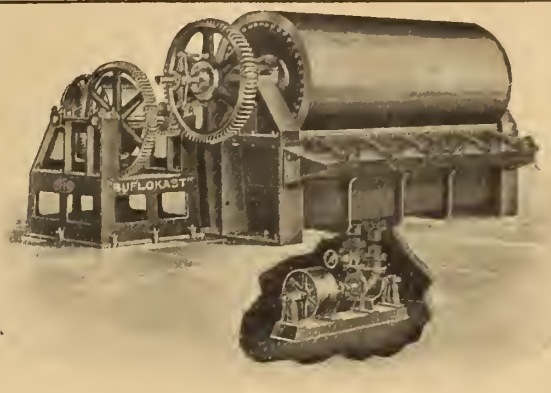

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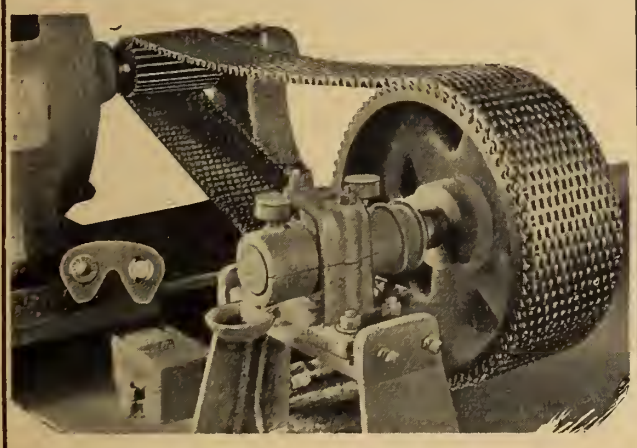

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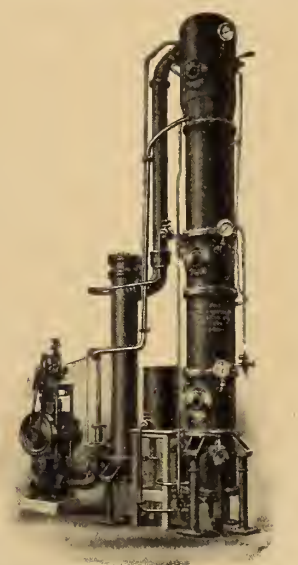

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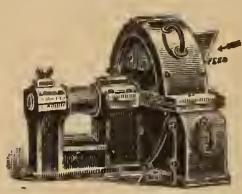

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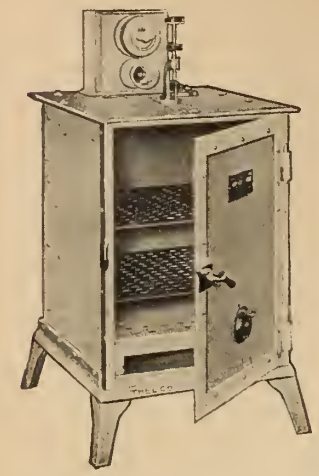

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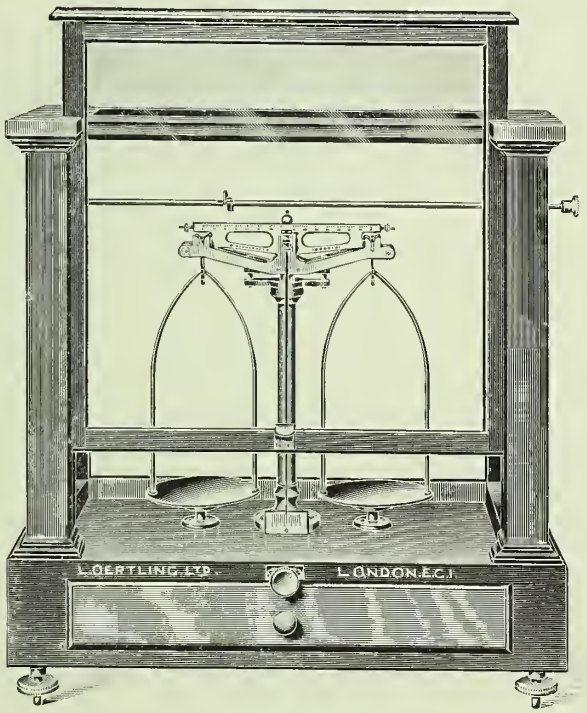

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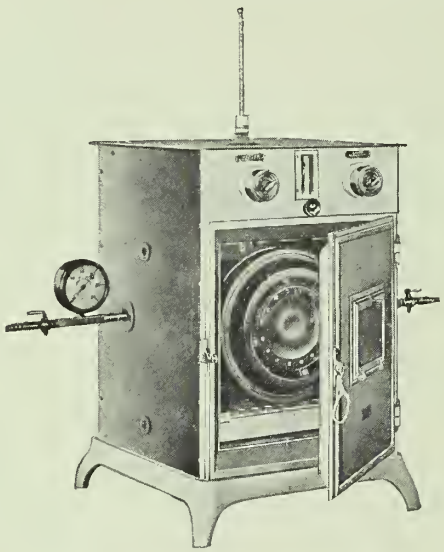

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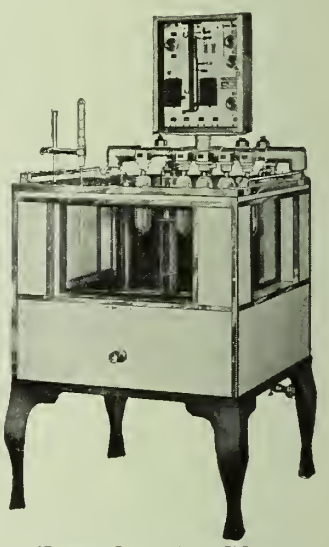

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ONTARIO'S MINERALS

PROVINCE OF ONTARIO

Hon. Chas. McCrea, Minister. DEPARTMENT OF MINES *Thos. W. Gibson, Deputy Minister.*

Preliminary Summary of Mineral Statistics

(Quantities represent shipments. Tons throughout are short tons of 2,000 pounds)

Product		1921 Quantity	1921 Value	1922 Quantity	1922 Value
METALLIC					
Gold	ounces	709,509	$14,624,085	$1,000,199	$20,674,109
Silver	"	8,412,059	5,497,160	9,167,846	6,491,271
Platinum metals (a)	"	915	51,060	642	38,884
Copper	lbs.	3,070,719	356,708	4,503,358	515,093
Nickel, metallic	"	5,430,147	1,825,359	11,175,326	3,171,434
Nickel, oxide	"	1,402,019	285,391	2,399,887	391,119
Cobalt, metallic	"	32,718	98,228	109,067	282,602
Cobalt, oxide	"	155,554	354,418	398,697	798,271
Other nickel and cobalt compounds and residues	"	108,814	114,069	1,070,935	255,034
Copper in matte exported (b)	tons	3,686	737,142	7,774	1,554,731
Nickel in matte exported (b)	"	4,850	1,939,851	8,689	3,475,649
Iron and briquettes (c)	"	100	459	4,304	25,261
Iron, pig (d)	"	82,838	2,079,729	14,052	340,730
Lead, pig	lbs.	3,570,222	190,843	2,895,695	173,742
Zinc (e)	"	.....	.....	100,283	2,181
Total metallic		.....	$27,574,202	.....	38,190,711
NON-METALLIC					
Actinolite	tons	78	$ 975	$ 50	$ 345
Apatite (Phosphate of Lime)	lbs.	.....	.....	31	248
Arsenic, white	"	2,982,525	233,763	4,118,695	299,940
Arsenate of Iron	"	.....	.....	75,000	938
Corundum	tons	402	50,250	.....	.....
Feldspar, crude and ground	"	15,506	114,059	15,515	94,985
Fluorspar	"	115	1,744	284	3,905
Graphite, crude and refined	"	363	23,273	626	34,124
Gypsum, crushed, ground and calcined	"	84,765	433,053	110,227	621,668
Iron Pyrites	"	19,375	91,604	11,235	39,763
Mica	"	222	29,630	2,229	56,480
Mineral water	Imp. gals.	.....	9,000	31,970	6,118
Natural gas	M. cu. ft.	8,590,000	2,953,000	7,919,390	3,902,800
Peat	tons	500	2,000	3,000	14,500
Petroleum	bbls.	172,859	466,716	164,732	439,286
Quartz and silica brick	tons	12,957	74,635	82,882	149,302
Salt	"	149,599	1,509,287	161,551	1,537,512
Talc., crude and ground	"	9,967	140,390	12,874	178,397
Construction Materials—($11,527,529)—					
Cement, Portland	bbls.	2,723,072	6,425,266	3,104,386	6,235,370
Lime	tons	91,355	1,172,680	116,769	1,315,479
Sand and gravel	cu. yds.	1,412,956	668,098	2,132,875	1,001,088
Sand-Lime brick	M.	.....	456,700	48,924	770,597
Stone, building, trap, granite	"	.....	1,812,863	.....	2,205,025
Clay Products—($5,103,618)					
Brick, common	M.	99,463	1,743,094	105,536	1,803,349
Brick, pressed	"	31,481	673,087	44,892	900,111
Brick, tapestry or rug	"			22,453	514,666
Tile, drain	"	9,910	250,040	10,110	260,312
Tile, building and floor	"	.....	211,529	.....	562,566
Pottery	"	.....	67,985	.....	88,889
Sewer pipe	"	.....	939,464	.....	973,824
Total non-metallic		.....	20,554,185	.....	24,011,458
Add metallic		.....	27,574,202	.....	38,190,711
Grand Total		.....	$48,128,387	.....	$62,202,169

(a) Recoveries from Canadian and United States refineries. (b) Copper and nickel exports in the form of matte were valued, respectively, at 10 and 20 cents per pound. (c) Exports and shipments to points other than Ontario blast furnaces. (d) Proportional product from Ontario ore smelted. (e) Recovery from concentrates shipped in 1919 and not previously reported.

Dividends and Bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies, or a total of $114,334,884.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

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They give reliable service even with the most severe short-circuit conditions.

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EDMONTON, 211 McLeod Bldg.

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See Bulletin E.

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Acetic Acid	Hydriodic Acid	Nitric Acid	Salicylic Acid
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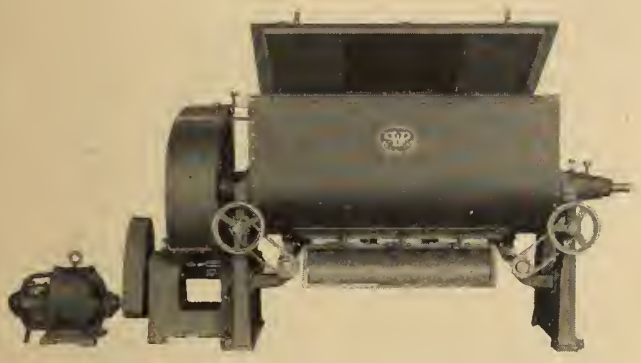

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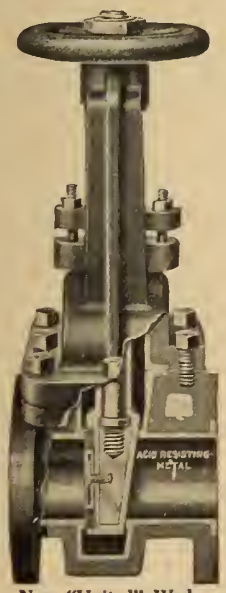

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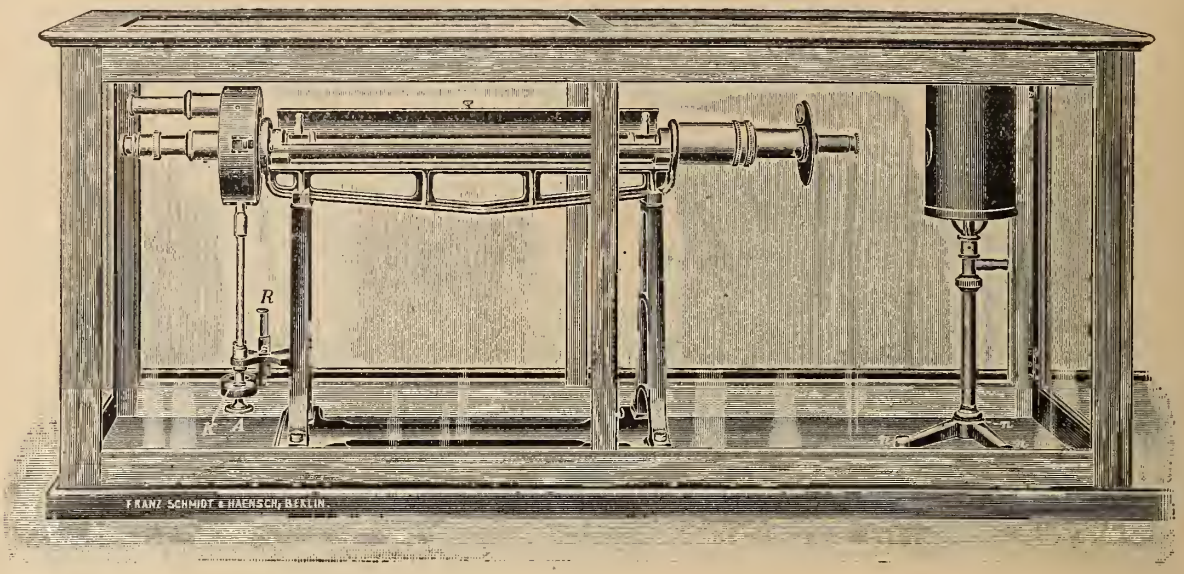

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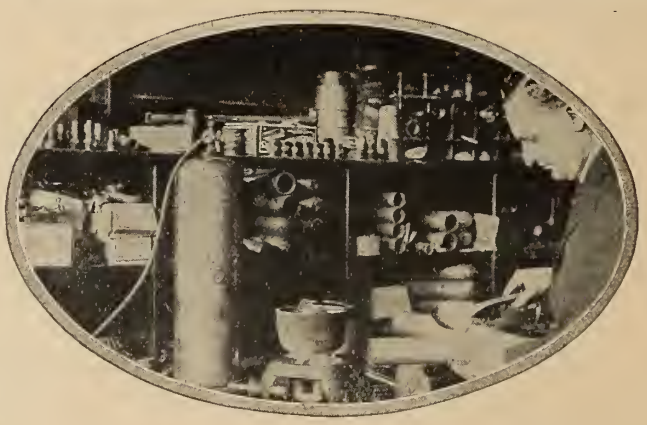

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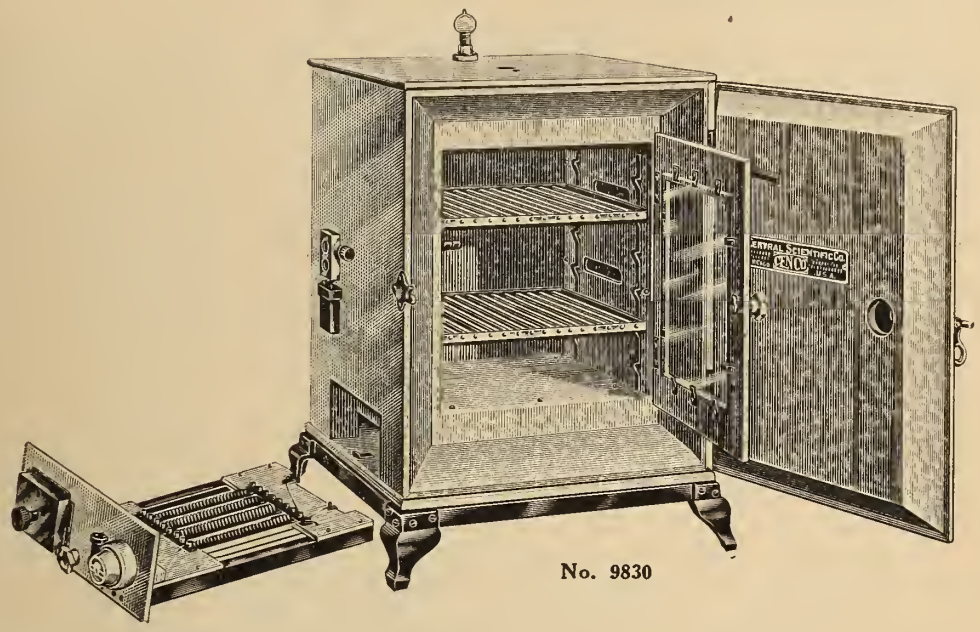

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No.		B	C
	Height inside, inches	14¾	19¾
	Width inside, inches	12	17
	Depth inside, inches	11¾	14
	Shelf space, square inches	282	476
9830.	**For 110 volts**	**$140.00**	**$220.00**
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15 cm
EACH BOX CONTAINING 500 FILTERS
THE ASHES OF EACH FILTER= 0.000083 GR.
TREATED WITH HYDROCHLORIC AND HYDROFLUORIC ACID

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Its superiority has been more fully realized and better appreciated by many chemists during the past few months, owing to the marked scarcity of German filter paper.

Weight of ashes from Munktell's Filter Paper

	Cm. 5.5	Cm. 7	Cm. 9	Cm. 11	Cm. 12.5	Cm. 15	Cm. 18.5
	Gram	Gram	Gram	Gram	Gram	Gram	Gram
No. **00**	.....	0.000018	0.000030	0.000045	0.000058	0.000083	.....
" **0**	0.000060	0.00010	0.00017	0.00025	0.00033	0.00046	0.00070
" **0B**	.....	0.00014	0.00024	0.00035	0.00047	0.00065	.....
" **1F**	0.00014	0.00023	0.00038	0.00056	0.00073	0.00105	0.00161
" **2**	0.00018	0.00030	0.00051	0.00074	0.00095	0.00138	0.00209

No. 0 Washed with Hydrochloric Acid, removing traces of iron, alumina, etc. The ash is reduced to a minimum and a high standard of purity is secured. A uniform and quick filter retaining fine precipitates, and adapted to the most precise requirements of analytical work.

(Corresponds to S. & S. No. 589 white band filters.)

5.5	7	9	11	12.5	15	18.5 cm.
.40	.54	.84	1.10	1.26	1.70	2.50 per 100

No. 0B Same quality as No. 0, but somewhat heavier, filters more rapidly and retains the finest precipitates. A new paper, and will be found thoroughly satisfactory for analytical work.

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7	9	11	12.5	15 cm.
.60	.96	1.26	1.40	1.90 per 100

No. 00 Washed with Hydrofluoric Acid and Hydrochloric Acid. For special scientific work.

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1.10	1.60	2.00	2.20	2.50 per 100

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In sheets 48 x 48 cm. 1.20 per quire. 20.00 per ream (480 sheets).

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.22	.32	.50	.60	.80	1.00	1.50 per 100

No. 2 Medium thickness. Not as closely made, therefore more rapid in filtration. A good paper for laboratory work.

5.5	7	9	11	12.5	15	18.5 cm.
.20	.26	.40	.52	.62	.80	1.06 per 100

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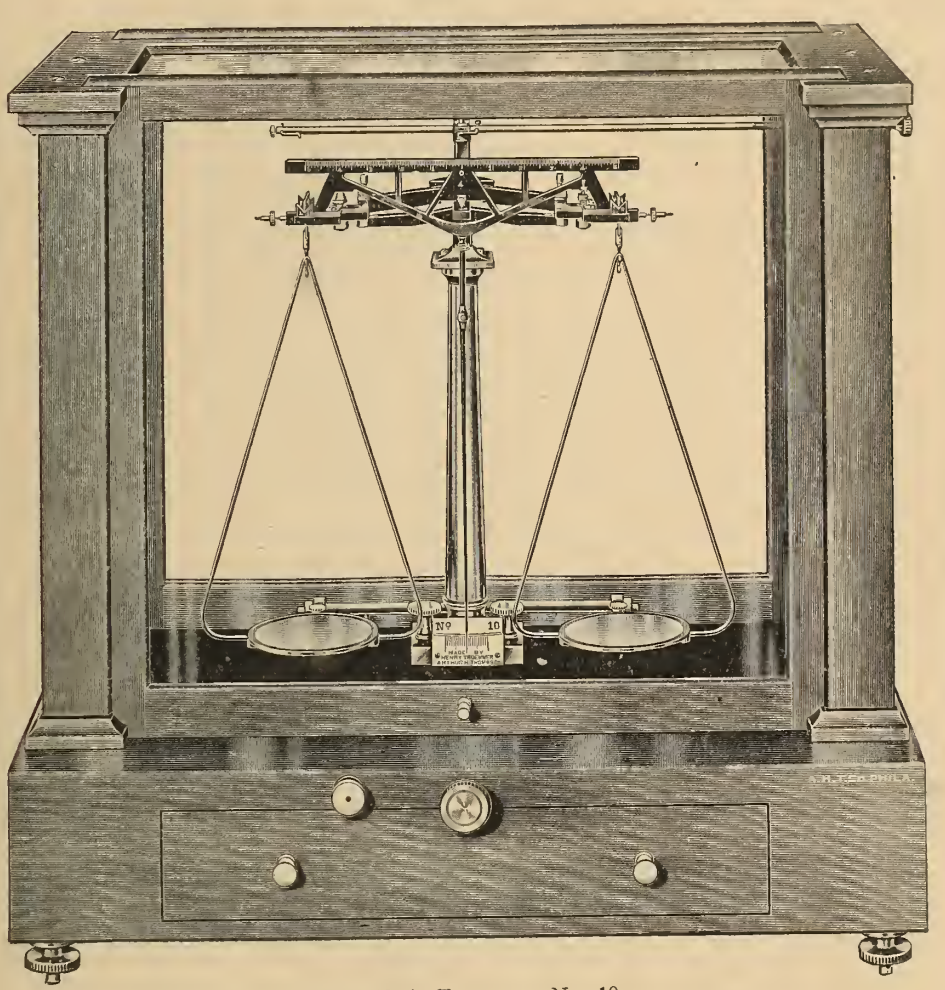

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The National Hand Fired Stoker consists of a system of downward sloping grate bars, fuel pushers, dump plates, boiler front, bridge wall and ignition arch. In firing, all that it is necessary to do is to dump the fuel on the upper end of the grate and when this is coked, it is moved a stage further down by means of pusher rods operated from the front of the furnace, and the fresh charge of fuel may be dumped in.

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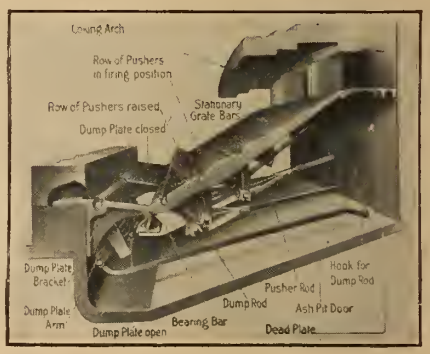

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Vol. 7 No. 11 **TORONTO, NOVEMBER, 1923** **$3.00 a Year; 40c a Copy**

P. F. McCLEARY, Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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From the Publishers—

Service Through a Canadian Chemical Paper----III

In these little talks with our readers, the various ways in which a chemical paper serves them have been pointed out. Some of these are so obvious that they may be entirely overlooked. For example, perhaps one-half of the chemists of Canada never, or at very rare intervals, attend a meeting of any chemical organization. Distance and a variety of reasons keeps them away. The simple reporting of the activities of chemical organizations is a service that allows them to keep informed.

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Contents—Issue No. 39, Issued June 1st: Determination of Diastatic Strength, Malts and Malt Extracts, by Dr. C. A. Munsterman; Note on Precipitation of Copper, by A. W. Beshgetoor; Analysis of Refined Tin, by W. H. Jacobson; Notes on Carbon Determinations by Combustion, by D. M. Strickland; Estimation of Sulphide and Thiosulphate when Present Together in Solution, by Jos. W. Coxe, Jr.; Note on Folding Filter Paper, by A. Regenbrecht.

EDITORIALS

EMPIRE POSSIBILITIES AND WORLD AFFAIRS

KALEIDOSCOPIC abruptness, coupled strangely with well-marked general tendencies, seems to summarize alterations in the European situation. Strange political combinations loom up. They are based on trade necessities, because, in the last analysis, these things are weighty in public opinion. Germany is like a burning structure, where, for the moment, the framework stands out in false strength, after everything else is gone. German industrialists are in command; but their security is gone. It went first with the army, and is now in double danger—disintegration of the State, and a loss of control of the workers.

This loss of a most essential factor seems to be the chief cause of the willingness to bargain with the French. They can supply once again the essentials that made the German industrial machine possible. That the French will undertake this control, and leave much to the individual German directors of industry, is doubtful.

Europe presents a great scattering for cover at this moment. Russia has swallowed some of her theories, and is interested in exporting wheat. This swinging-back process may arrive at a condition where remarkable progress will be possible in that country. If France can handle the German situation a little longer, her policy may indeed be fully vindicated at home, and, to a fair degree, abroad. France, it seems, would be better content with the destruction of her enemies' potential power than with any payment of debts.

The United States is in the position of a youth, physically able, but steadfastly refusing world responsibility. Perhaps this situation will alter soon. In the meantime, the world knows, and is to quite a degree guided by the fact, that the United States is the largest silent potential source of energy available to protect a national right should a major necessity arise.

Empire conferences are beginning to get down to serious business. Never recently has any British Government been presented with more fundamental industrial problems. The artificiality of British Industry is becoming more apparent. Trading, in the old sense, is gone. It is not sufficient to command shipping and bring to the British Isles those essential foreign products, and return them to people in distant lands in a manufactured condition. Unfortunately for British manufactures, the people in Canada wish to make their own textiles. India has ambitions as a manufacturing country. Australia and South Africa are not content with anything less than full manufacturing development. Foreign lands everywhere are ambitious for industrial development. This is a problem indeed. One solution may be the equalization of population within the Empire, and the transportation of such products only as climatic conditions or natural resources make essential.

This may mean the transportation of British money and British workmen to other parts, but that is inevitable. It may be a slow process, and it may result in no actual falling-off of manufacturing in the British Isles; but it is nonsense to suppose that any country is going to allow the arts to flourish elsewhere while they supply the raw materials.

If these adjustments of population and manufacturing ability are made when and how they should be, the possibilities of the Empire are such that her position of leadership stands secure. Her destiny is very much in her own hands, and there are good indications that all parts see the light.

EMPLOYING BETTER CHEMISTS

IN Canada, so far, University training has been the ambition of most of those who desire to make a life work of chemistry. In Europe, and England in particular, a great number have entered chemistry by the works laboratory, and have not taken the time to secure the same, broad, general basis that is the principal result of a university course.

Technical schools are turning out young men who seek positions as chemists in increasing numbers. They satisfy the requirements of industry to the extent that they are prepared and able to work for less money than they would if they had made an investment in a university education. As a rule, they are content with less, and more willing to fit into a routine position.

They are essential, but should not be mistaken by employers for chemists who have had a far better training and may be counted upon, on the average, for more constructive development. Too frequently, the small salary of some chemist is the boast of his employer. "Why, we have a boy from the technical school. He is only getting —— a week. He does all our work," etc., etc.

This may be true enough. One need hardly go even to a technical school to learn a vast amount of routine analysis; but it is a dangerous thing for the profession when the idea is created that a man may become a chemist by the process of learning

how to do a few standard tests, in one industry. It is difficult for the real chemist to overcome this situation, and secure an opportunity to demonstrate that training counts. Unfortunately, many university graduates are responsible for this condition. They steadfastly refuse to create opportunities for men as well-trained as they themselves are.

While we agree that we shall always have chemists, from directors of research and consulting chemical engineers, down to bottle-washers, there should be no effort made to increase the number of the poorer grades or give those who employ chemists the idea that the latter are the only ones required to make an industry go ahead.

Let us keep our Canadian standards of chemical training high, by employing the better-trained man. He is bound to pay more dividends in the long run.

MORE ABOUT LUBRICATION

LAST month we suggested something of the chemist's outlook upon the subject of lubrication. Some further comment is necessary to emphasize that this is not merely a chemical laboratory problem. Progress in the art must come from those chemists who possess a real understanding of the physics involved, and by their earnest co-operation with engineers who are alive to the importance of the economics of loss by friction.

The ideal in lubrication is to prevent metal-to-metal contact under pressure, speed and temperature, and with the least loss of power Many factors are concerned, and much study and research is required to determine when and where to use mineral lubricating oils, compounds of mineral and animal or vegetabl eproducts, semi-solid lubricants, and what the quality and quantity should be. Lubrication is probably one of the most crudely performed operations in most plants, and much educational work has to be done to drive home the knowledge obtained by the co-operative work of chemist and engineer.

As a job around the plant, lubrication is generally left to one of the lowest paid of laborers. He pours or packs as much "lubricant" on the moving parts as will not overrun too much on the floor.

The oil and oiling necessary for a dough mixer will not suit a cement mixer and neither will be good for the office clock. However crude this may sound, it reflects the present state of the art in many directions.

Oiling is not rated highly, and reservoirs and grease-cups are filled with anything sold as a lubricant. Seized bearings and consequent stoppage of machinery often seem to be looked upon as a case of neglecting to flood the parts with oil rather than any possibility of questionable oil quality.

Some oil companies have been doing pioneer work by the maintenance of research laboratories employing chemists and engineers who have specialized on lubrication as applying to several of the industries. Their published results are doing much to develop the interest of plant engineers towards an understanding of what proper lubrication can mean to the plant in dollars and cents.

The field is a large one and much work has to be done; what is known is not to be compared with what ought to be known. The conditions surrounding the operation of all classes of equipment have to be very carefully studied by operating engineers and the various factors involved considered with the help of the chemist. For instance: is the speed too low; the load too high; the bearing unevenly distributed; what is the relation to temperature; and what load per square inch of surface shall the oil be subject to? What part does surface tension, adhesion, evaporation, and physical and chemical make-up of the lubricant play here?

These are the questions and very many others which enter into problems of correct lubricating practice and which await solution by the co-operative efforts of chemist and engineer.

CANADA AN ATTRACTIVE LAND FOR CHEMISTS

PROBABLY more chemists have left Canada than ever left any other country of the same size. They are to be found all over the United States. Many of them have risen to positions of importance, as Professors, Directors of Research and Executives. The United States and Canada have been trading chemists for a long time. Europe and the British Isles have supplied Canada with some of her outstanding chemists, but there has been naturally very little reciprocity.

More recently, there has been a marked looking over the seas to Canada, on the part of many younger British chemists. If the quality is right, there is much to be said for the bringing-together of men trained in widely-separated schools. Not having, to the same degree, large and established chemical industries, there is a tendency to turn out from our schools men whose teaching has been sound, but whose industrial balance needs further adjustment. While this is true of graduates everywhere, our Universities are just a little ahead of our industrial opportunities. If we can introduce chemists from abroad, who bring along fair contributions in ideas, we have gained.

If we are to have our proper growth, it must be through the assistance of workers from other lands, and it is not to be wondered at that, during a

period when so many are considering taking up residence in Canada, there should be an unusual interest in the opportunities Canada presents to chemists.

Just as Canadian opportunities in the agricultural field are open to those who have the stamina to succeed under new conditions, and by the process of hard work, so in the professions, there are opportunities, but they are singularly dependent on the individual himself. Canadian industries need chemists, but they should be moulded from the type who can walk in where a chemist never trod before, and sell chemistry along with their personal services. For this ability, by the way, someone should create a degree. It is easily the equivalent of a Ph.D. thesis.

TEACHING JUNIOR AND TECHNICAL SCHOOL CHEMISTRY

ABOUT this season of the year, university teachers again become impressed with the knowledge of chemistry, or lack of it, that is brought to first-year classes. Upon this basis, they are asked to build up a living structure. A new class can generally be divided in two ways; those who have been taught chemistry by an individual who graduated from a university in an honor course in chemistry; and those who have picked up some chemistry from a teacher who is not a specialist, and who knows nothing of the subject beyond the dogma set forth in one small text-book.

Chemistry, because it is experimental, (and we shall not consider those places where chemistry is taught without a laboratory), takes a strong hold on the average pupil. Yet there are many teachers who manage to destroy the desire for knowledge, by their utter lack of ability to relate the subject to anything that is practical or industrial. Physics seem to fare much better.

Is it not a fact that it is the very exceptional teacher of chemistry in our collegiate institutes, and, to a great degree, in our technical schools, who can think of chemistry in terms of everyday life, or who knows enough about industrial chemistry to make the subject interesting and alive? Do the text-books used indicate properly that Canada has chemical industries, or that her industries are under chemical control? Are the majority of teachers really at home with their subject? Would they pass as chemists themselves, and, if not, how can they teach chemistry?

We appreciate that they do not claim to be chemists, and are not teaching industrial chemistry. To offset this, one need only look at the examination papers. These are filled with questions asking the student how definite products are made in industrial plants.

In technical school work, conditions are rapidly improving, and due recognition of the progress should be made. But those who undertake major courses in Universities have not passed through these better schools. They are the perfect product of text-book chemistry, well crammed with theory, but most uncertain about what it all means.

If we cannot take the boys and girls to real plants and works, at an early stage, would it not be possible to stir up a little interest on the part of teachers? Botany is studied in the field, but chemistry is still bone-dry, because the average teacher never had the right experience to call upon.

One may write an equation involving $KMnO_4$, and not be able to bore a hole in cork.

PUBLIC OWNERSHIP OF BY-PRODUCT COKE PLANTS

THE public of central Canada seems to be more impressed by the fact that Henry Ford has built a coke plant than they were by all previous preaching against the waste involved in burning raw coal.

Sir Adam Beck is now reported as investigating the possibilities of a large industry in the Niagara Peninsula for the treatment of coal and its by-products as a gigantic public ownership undertaking.

Broadly, the public of Ontario and Quebec, at least, have an idea that $15.00 per ton for domestic coke leaves an excessive profit for someone in the deal, if there is any value whatsoever in the products taken out of the coal. Nova Scotia is using all the coke she can get, and has her own coal in abundance.

The fact seems evident that we are just beginning to wake up in Canada to the possibilities. If Ontario should decide to go into this branch of industry on a public-ownership basis, the public would probably support the idea very strongly, and the chances are, not only that coke prices might be modified, but a variety of industries stimulated, particularly in such a district as Niagara.

CANADIAN WOOLLEN MANUFACTURERS STUDY RESEARCH

The Canadian Association of Woollen Manufacturers have taken a step recently which may lead to an important co-operative movement. A committee consisting of Capt. J. Dick, of Cobourg Dyeing Co., Cobourg, chairman; A. Burton, Canadian Dyers, Ltd., London; Dr. F. Zeidler, Dickinson Dye Works, Toronto, and H. Battye, Chief Chemist, Toronto Carpet Co., Ltd., Toronto, has been appointed to study the possibilities of establishing a co-operative laboratory for testing materials and developing research work in the interests of the textile trades.

Operation of a Modern Gas Works*

Gas and Coke as Fuels

Practice at Halifax, N.S. Described with Comment on the Future of the Industry.

By K. L. Dawson, *Assistant Superintendant, Gas Department, Nova Scotia Tramways and Power Company, Ltd., Halifax.*

In modern standard gas works construction the chamber or retort into which the coal is placed for treatment is more or less rectangular in cross-section. According to the position of its longitudinal axis it is known as a horizontal, inclined or vertical retort. It may be built to hold 300 pounds to 2000 pounds of coal. Usually it is made up of carefully molded silica blocks, grooved and tongued to fit snugly together. Any small cracks fill with carbonaceous material, the whole soon becoming tight. Because the heat which is applied to the exterior of the retort must penetrate through its walls into the heart of the coal mass inside, the walls are made as thin as possible, consistent with strength and the width of the retort is restricted to from twelve to twenty-four inches. The other dimensions of the cross-section may be, say fifteen inches to thirty-six inches. The length of the retort may be five feet to twenty feet or more, depending upon the position of the long axis or the methods employed for filling or emptying. Doors are provided at one or both ends through which the coal is inserted and the residue removed and one or more openings through which the gas may escape.

The heat to which the coal is subjected comes from a furnace below the retort in which is a bed of incandescent coke three to six feet deep. The air for its combustion is admitted through a shutter, which can be readily and accurately adjusted. On its way to the underside of the grate it is conducted through passages heated externally by the waste gases on their way to the chimney. In these it is pre-heated and mixed with superheated steam. The steam serves two purposes. It abates the evil formation of hard clinker and gives to the furnace the function of a gas producer. The gas from the top of the fire passes through nostrils upwards into the flues surrounding the retort. Here it meets a current of pre-heated secondary air and complete combustion is attained giving a higher temperature around the retort than is attained in the furnace, which is just what is needed. In the gas works at Halifax the temperature in the furnace is between 1800°F. to 2000°F.; around the retorts 2200 to 2300°F.

This distillation by which the coal is now being separated is a very violent affair, much different to laboratory distillations. As you see, the coal is placed in a retort already as hot as we expect to get it and therefore our distillation products are going to be entirely different from the original constituents of the coal. After gasification the products are subjected to the decomposing influence of the red hot coke and the silica walls of the retort and their radiant heat. Also the atmosphere in the retort is continually changing and to a certain extent the pressure. These physical surroundings give rise to secondary chemical reactions which are of first order of importance. Without them benzol and toluol which are so important in the color industry would be produced in much smaller quantities.

The temperature around the retort and the distribution of the heat along its surface must be capable of control and regulation. Precision instruments and properly placed dampers are in continuous use in an efficient plant. Too high temperatures cause the formation of lampblack and naphthalene. Lampblack is carried forward in the gaseous stream from the retort and mixing with the condensed tar gives rise to stoppage in gas and tar mines. One can hardly visualize how tenaceous and rubbery a mixture of lampblack and tar can become until he must open a passage through a pipe which is stopped with it. Naphthalene will be carried forward into the distribution pipes where it will sublime in flakes like snow. As the pressure in these mains is usually small, very little naphthalene can produce a stoppage. If the temperature is too low, not all the gaseous constituents will be removed from the coal and the residue will have a dirty appearance instead of the clean, silvery lustre which we are accustomed to see. Too high or too low temperatures will therefore result in increased efficiency.

The gaseous mixture coming from the retorts is of course hot and requires cooling, a matter of equal importance with its production. Any method of reduction will not suffice. The reduction must take place in such a way that a maximum quantity of all the valuable constituents will be retained in the gas.

Perhaps the best way to tell the various steps in the process of preparation through which coal gas must pass before it is marketable is to describe how it is done in a plant with which I am familiar.

Handling Crude Gas

In Halifax the crude gas is drawn from the retorts through the primary condenser to the exhauster. The condenser is a vertical cylindrical tank containing a number of large tubes. Through the tubes a current of air is flowing upward under natural draft. The gas entering the condenser is forced to take a circuitous path back and forth around and between the tubes by baffles which are placed horizontally. As it passes, the liquid and solid matter is reduced by agglomeration and subsequent deposit in the same way as globules of water in a cloud produce rain. The change in direction and velocity of the gas caused by the baffles produces the necessary physical conditions. As this is going on the temperature is reduced under absolute control to a predetermined point.

The Exhauster is a mechanical contrivance usually operated by a steam engine which sucks the gas through all the apparatus preceding and pushes it through all the apparatus following it. The vacuum created on the suction side will support a column of water 1 inch high at the exhauster and 2/10 inch high at the retort. The pressure in the main at the outlet of the exhauster will support a column of water about fourteen inches high.

The first piece of apparatus on the pressure side is the tar extractor. The gas enters an inner chamber of which the walls are made of several perforated plates, one outside the other. The perforations are so made and arranged that a row of pinholes in the inner plates will oppose a blank space on the plate next outside. Screening by and impact on the successive plates following change in velocity and direction of flow between the plates, changes the vapors of tarry liquids into liquid tar which runs down the plates and is withdrawn through a seal.

Because tar vapor absorbs various undesirable constituents such as naphthalene, its capacity increasing with the reduction of the temperature, it is allowed to remain with the gas to as low a temperature as may be for the purpose; but as it is also an absorbent for the hydrocarbons required for illuminating purposes, it must not be allowed to remain when the temperature falls so low that the illuminants will be removed to an injurious

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extent. The proper temperature as determined by numerous experiments is 90°F. to 105°F.

In a plant sending out 300,000 cubic feet of gas per day, the secondary condensation and cooling for the reduction of other vapors can usually be accomplished by a water-cooled condenser, similar in construction to the air cooled primary condenser, which I just described. Such vapors as will condense here will be deposited in very close accordance with their vapor tensions. As they deposit they are removed from contact with the gas to prevent their solution of vapors which it is desirable to retain.

As an illustration of factors to be remembered in the design of this condenser consider the vapor of naphthalene. At any temperature, say 70°F., there will be certain amount of naphthalene vapor in the gas according to the vapor tension of naphthalene at that temperature. Benzol will be present in a certain quantity due to its corresponding vapor tension. But as benzol is a solvent for naphthalene it is found that the naphthalene content in the presence of benzol may exceed the quantity corresponding to its simple vapor tension. If the condensation and cooling is not done efficiently here, then at some point further along some benzol may liquify freeing the naphthalene it was carrying. This will cause a super-saturation of the naphthalene followed by its deposit in the solid form.

The gas passes from the secondary condenser to the washer where its flow is broken into many minute streams which bubble upward through two to three inches of water. The primary function of the washer is to remove the final traces of tarry matter and whatever dust may have remained in the gas to this point. It has however a secondary function which is due to the use of water in it. At the inlet of the washer the temperature of the gas is 60 to 70°F. At this temperature the gas is ready for the removal of ammonia and hydrogen sulphide. Water readily absorbs ammonia, ammonia reacts slightly with hydrogen sulphide, therefore the washer removes a little of each.

From the washer the gas is conducted to the bottom of a steel tower which contains layers of coke supported on perforated trays over which a small quantity of water is trickling. As the gas passes upward it comes into intimate contact with the water exposed over the vast surface of the coke and a great proportion of the ammonia is absorbed by the water. The remainder is absorbed in a second tower to such an extent that a stream of gas impinging on moistened tumeric paper will cause no change of color.

Removing Sulphur Compounds from Gas

The gas from a good grade of United States gas-coal will contain from 200 to 500 grains of sulphuretted hydrogen per 100 cubic feet at this point. The gas which we obtain from native coals contains 600 to 800 grains. Its removal in its entirety is comparatively simple. When the gas is passed through layers of iron oxide such as bog iron ore, two to three feet deep, supported on perforated trays in suitable containers, the sulphuretted hydrogen is removed by a reaction which changes the oxide to the sulphide. The purification of a daily output of 300,000 cubic feet of gas containing 700 grains of sulphuretted hydrogen per 100 feet means the removal of 300 pounds of hydrogen sulphide per day, four and one half tons per month. Under these conditions the oxide is rapidly sulphided until it must be removed and replaced. Up to a certain point the foul oxide will be revivified by exposure to the air, but repeated foulings will finally render it useless when it must be discarded in favor of fresh.

Gas from American coal will now contain ten to twenty grains of organic sulphur per hundred cubic feet while gas from the best native coals which we have been able to obtain will contain from fifty to seventy grains. The larger quantity is present in the form of the vapor of the extremely volatile carbon bisulphide and there is no simple way of removing it. One company accomplishes it by raising the gas to a high temperature, 600°F. in the presence of iron oxide. The water vapor ordinarily carried in the gas augmented by the introduction of steam if necessary reacts with the carbon disulphide and results in hydrogen sulphide and the oxides of carbon. The hydrogen sulphide may be removed by further contact of the gas with iron oxide. Processes like these could not be considered for Halifax because of their high cost. Instead the gas is passed through a series of three towers in which a petroleum distillate known as pale paraffin oil is flowing downward through excelsior and wooden grids, while the gas is passing upward. Using about ten gallons of oil per 1000 cubic feet of gas at a temperature slightly lower than that of the gas it is possible to accomplish the removal of 40% of the organic sulphur, which leaves a quantity entirely inoffensive when the gas is burned in properly vented appliances. A good general rule is that all appliances consuming extensive oxygen should be vented. By heating the oil to 260°F. the vapors absorbed are expelled. It is then ready for use again.

The residue left in the retort when the distillation has been carried as far as it is practicable is coke. Except in the case of some types of vertical retorts it is hot when withdrawn and has to be cooled by quenching or smothering. When crushed and sorted it is ready for marketing.

This description of the process followed in a small gas plant, which is much more simple in design and equipment than large plants, should prove that the production of city gas is an intricate process demanding the correlation and control of physical and chemical phenomena in the design and operation of all of its equipment.

Those hydrocarbons in the coal and their degradation products which give rise to the smoke from an ordinary fire may be considered to comprise that portion of the coal from which gas and tar are obtained—the greater their quantity in the original coal, or, technically speaking, the higher the volatility of the coal, the greater the volume of gas obtainable. Whether or not marketable products may be obtained from the distillation of a given coal is usually inferable from its proximate analysis and the appearance of the residue left from the volatile test. A high percentage of volatile must be accompanied by a low percentage of ash and especially a low percentage of sulphur, and the qualities which will produce a clean coherent coke, not readily friable. Such coal is growing rarer and the price of what is now available is rising.

It seems natural then for the gas men to dream of a paradise where any old kind of coal can be changed entirely into a marketable gas with no by-product except cinders. Their business is primarily the manufacture and sale of gas, a fuel from which heat is most readily available. They desire to be free from the production and sale of a solid fuel which complicates their plant and puts them in a business of larger dollars and cents annual turnover than their gas business. Their problem would be much easier if the general public knew more concerning the use of fuels and this is where the Engineering Institute of Canada has undertaken to help a little.

The Ideal Complete Gasification of Coal

A great deal of work has been and is being done on the development of a process for the complete gasification of coal. All the processes reported on are in the experimental stage and it is not possible to predict from the data available when any of them will become a commercial success.

At the same time a cheap way to prepare the gas from high sulphur coals is being sought with partial success in some of the larger plants. Much interesting and valuable research can be and should be begun and encouraged along this line. In connection with the coal itself recent investigations show that the distribution of organic sulphur on the vertical span of a coal bed is quite uniform. On the other hand, intense irregularity of distribution is characteristic of the pyritic sulphur in coal. This offers a possibility of securing a low sulphur product by separate mining of parts of the seam.

The analyses of typical gas coals show roughly:

	U.S.	Cape Breton
Moisture	2%	2%
Volatile Matter	38%	37%
Fixed Carbon	55%	55%
Ash	5%	6%
Sulphur	0.6—1.25	1.8—2.2

In general the thermal efficiency of a gas plant may be conservatively considered as 75%, some approach 80%.

A ton of coal treated in the gas works will produce 11,000 cubic feet of gas containing 520 British heat units per cubic foot, or a total of 5,720,000 heat units. Assuming that the average household efficiency in the consumption of coal is 30% and that the original coal contains 13,500 heat units per pound, the quantity of useful heat from a ton of coal burned in a house is then 5,100,000 units, a quantity less than that in the gas which might have been obtained from the raw coal. Without going further into detail it can readily be seen that there is considerable force behind the argument that, in cities at least, the use of raw coal in houses should be prohibited in favor of gas or coke, from either of which the heat is more readily available, and which can be consumed under greater control.

Gas for House Heating

With coal at its present prices in Halifax and gas at $1.76 net per thousand cubic feet, the average family can cook its food and heat its water for domestic and private purposes more cheaply and much more conveniently in appliances burning gas than in those burning coal. An aggressive campaign to bring this home to the citizens has resulted in the net addition of 200 new customers during the past summer.

On consideration of the use of gas for house-heating it is well to remember that "It is not the cost of the fuel, but the cost of using it," which determines the relative charges for using coal, oil or gas. Recently, figures were given before the Illinois Gas Association showing that it costs no more ultimately to use gas than to use a high grade of coal or oil. As we stated in the beginning the consumer is interested more in 100% satisfaction than in 100% thermal efficiency. What is more simple than starting your furnace fire in the fall and letting it look after itself until spring? The automatic controls which are attached to a gas central heating plant will do the rest and there will be no ashes to handle.

The cost of a central heating plant to burn gas in the City of Chicago is $250 to $600 when attached to existing piping. With the gas at $1.00, estimates are prepared on the basis that the cost of gas per season will be:

For Steam 90 cents per square foot of radiation
" Hot Water 55 " " " " " "
" Vapor 75 " " " " " "
(10" vacuum).

These figures show that the cost for fuel will be approximately double that for hard coal.

The applications of gas in industrial heating are so numerous and varied that any attempt to describe them would need too much time. Recently a list of over a thousand uses was prepared and published. Suffice it to say that industry could no more do without gas for heat than it could do without electricity for power.

Notwithstanding the prognostications of Roger Babson to the contrary, the gas industry is on the eve of its greatest development. In the industrial heating field gas is finding an avenue of expansion comparable only to that found by electricity in the field of industrial power. Any setback it may have received through its withdrawal from the lighting field has been fully overcome. Further the price of gas shows a tendency to decrease rather than increase. Expert attention is being given to increasing the efficiencies of the appliances which consume it. Everything seems to point to a brilliant future for it.

Any one who feels inclined to belittle its usefulness because of its apparent failure to pay its way in the Maritime Provinces where zealous salesmen of electric equipment and judicious propaganda were able to scare off the owners of the gas works in Windsor, Yarmouth, Charlottetown and Pictou, should make himself acquainted with the facts, then look for example to the growth of the sale of gas in a city like Toronto where gas at $1.00 per thousand cubic feet is competing so successfully against electricity at less than one cent per kilowatt hour that the gas company has more gas meters in use than the city has water meters.

Coke from Gas Works

In modern coke oven practice the aim is to obtain as much coke as possible from a ton of coal. Because most of it is used for metallurgical purposes where it is required to support heavy weights during all the time in which it is being consumed, such coke must be able to resist crushing at the same time as it burns readily. For best results the coke should be capable of being broken into large lumps approximating cubes. Coals extremely high in volatile matter may produce excellent results in gas works from which the coke is used for a different purpose. In coke ovens they will usually give a coke which breaks into needle-shaped lumps which are not desirable. Coals too low in volatile matter may produce no coherent coke at all. As a general thing coals containing sixteen to forty per cent. of volatile matter can be coked but coke oven practice demands eighteen to thirty-three per cent. Two coals, one high in volatile matter and the other low, neither of which will produce a good coke when alone, may give an excellent coke when intimately mixed.

In the gas works the aim is to produce gas and some of the residual coke is consumed to provide the necessary heat. At the coke oven the opposite holds. Coke is desired, gas is not, therefore some of the gas produced is burned to supply the heat. Perhaps fifty to sixty per cent. of the gas is consumed in this way while the remainder is available for any purpose to which it can be adapted. The chief difference between the method of carbonizing in the coke ovens and in the gas works is in the size of the unit in which the coal is treated. In the gas works the retorts are of limited size holding from 400 to 2000 pounds which is exposed to the heat during six to eighteen hours; at the coke ovens the oven is of comparatively unlimited size holding from five to twenty tons, which is heated during the period of from eighteen to seventy-two hours.

At the same time as he produces a strong suitably sized coke the coke-oven engineer is faced by the fact that he must have it low in sulphur and ash. To secure this he purchases only such coal as is naturally comparatively free from these evils, then he attempts their further reduction by crushing and washing it. Depending upon the condition of the coal and distribution of the sulphur a reduction of from forty to fifty per cent. in the ash and fifteen per cent. in the sulphur may be obtained. His objective is to keep the quantity of sulphur in his coke down below 1.25%.

Enough has been said to show that in gas works and coke ovens the kinds of coal carbonized must be of the very finest quality, and consequently must of necessity be the most expensive. For the gas works and coke ovens of this continent an enormous quantity of coal is needed every year. Those who know are uttering a continuous warning that the supply is not inexhaustible. Their percentage of sulphur more than their percentage of ash is the factor which shuts out cheaper coal from these industries. It is obvious, then, that those who search for a way to eliminate the troubles of sulphur from the carbonization of coal and the manufacture of gas deserve international recognition, support and reward.

Probably the chief distinctions between coal and coke are

the almost entire lack of volatile matter in the latter and its porous structure, which qualities enable it to be consumed in a single stage and at a high temperature to carbon dioxide. Chemically considered, coke consists of the carbon, together with all the mineral constituents of the coal from which it is made. It contains only a trace of hydrogen. The amount of carbon varies from eighty-five to ninety per cent. and the ash from five to fifteen per cent. When fired in furnaces under correct conditions of balanced draft, the formation of carbon monoxide can be largely avoided. The admission of secondary air is therefore unnecessary; and this fact permits the minimum of suction or chimney draught being maintained over the fire the whole of the air necessary for combustion being taken under the fuel bed. The inleakage of air through faulty boiler brickwork and economizer settings, also the by-passing and short-circuiting of hot gases, may thus be reduced to a minimum. With coke fired on these lines experience has proven that efficient combustion and a high calorific intensity are much easier to secure than in the case of coal firing. That coke has a higher calorific intensity than coal—which is not inferable from its analysis—is evidenced by the fact that it is used for metal-melting and other high temperature processes. The explanation probably is that the process of combustion being already far advanced by the heat absorbing process of distillation, less heat is required to gasify it than is necessary in the case of coal. Also the quantity of heat which is required to raise the temperature of one pound of coke through one degree is less than that required for coal. This last statement gives the reason that coke does not have the chilling effect of fresh coal when thrown upon an incandescent fire. In addition, as hydrogen is almost entirely absent there is no formation of water with its accompanying loss of heat which deprives coal of four and one-half per cent. of its original heating value.

Recent tests show that an evaporation of seven to eight and one-half pounds of water per pound of run-of-oven gas coke may be considered a fair output to be attained in practice with the same degree of care as is generally met with in good hand-fired boiler-room operation.

For a considerable time much difficulty was experienced in adapting coke to effective use on the automatic chain-grate stockers usually installed under water-tube boilers. This has now been overcome by the "Sandwich" system of blending coal and coke, invented by Mr. E. W. L. Nicol, the engineer to the London Coke Committee, London, England. The fuel is fed to the grate in such a way that the coke is between two much thinner layers of a poor grade of coal. Large quantities are being consumed efficiently in this way. With properly divided overhead bunkers and provisions for adjusting the mixture as it passes onto the grate, this method presents tremendous possibilities. The Greenwich electric power stations did not adopt it merely for the fun of making a change and the Manchester Corporation Electrical Engineer did not make provision for its use in connection with his new generating plant for any but economic reasons.

Amongst the solid fuels in use in the home, coke has no equal for cleanliness. None other can equal it in rapidity of response to any change in the conditions of draught. Perhaps this is its main drawback at the same time as it is one of its good characteristics. Some complain that their furnace-fuel will not last overnight, the fire either burns out or goes out. If the firebox is sufficiently large and the dampers capable of easy and close regulation the installation of an automatic damper regulator should obviate all difficulties. Only the very smallest of furnaces are unable to burn coke successfully.

Last winter the British Empire Steel Corporation found no difficulty in selling its surplus of coke, about 6000 tons per month, to the domestic consumers of the Maritime Provinces, a market in which hall stoves and small furnaces abound and in which coke was very little known. During the month after the first appearance of the Besco product in Halifax the sales of coke jumped from 400 to 2000 tons, good evidence of its popularity for domestic use. This year a still larger quantity would be consumed could it be obtained. Used properly, it is giving value ton for ton equal to hard coal, and there is usually a considerable price differential in favor of the ton of coke.

When coal is used for steam-raising under the best known conditions, it is obvious that there is little to be gained by any preliminary sorting of the thermal units of the coal into fuels of higher availability such as gas and coke. It is well known that an efficiency of seventy-five to eighty per cent. is attainable in steady practice. But best known conditions pertain to only 5% of the steam plants in the country. An increase of ten per cent. in overall efficiencies of the remaining ninety-five per cent. would reduce the national coal bill $9,000,000 per year.

The Acute Problem of Central Canada

Domestic purposes account for the use of one-fifth of the annual national consumption. For 1921 the actual figures would be one-fifth of thirty-one million tons, 6.2 million tons. If we compare a liberal household efficiency of thirty-five per cent with the average efficiency of the best steam plants we at once see the extravagance of the waste involved in such use of coal. In this new country often spoken of as containing unlimited resources we are inclined to take things as they come and not look too far into the future. The position of central Canada in relation to her fuel supply should awaken us to added interest in and support of research which will bring curtailment of our wastefulness. Due to the transportation distances the present problem is, and the future problem will be one of utilization. Certainly, the people in the central provinces are the ones most vitally interested, and it is to be expected that they will take the lead in the technical and economic solution of their difficulties invoking the assistance of new legislation if necessary. Those provinces contain the bulk of Canada's population and manufacturing plants therefore they will benefit most from any savings which can be accomplished. We can learn many lessons in the economic use of domestic fuel from those countries like Norway and Sweden which must import from foreign countries the bulk of their coal and coke.

When we consider the number of combinations which are possible of different primary products, when the temperature and pressure are each varied it is obvious that a great amount of work can be done usefully in following up the distillation of coal. Great progress may be expected along these lines and greater developments than any heretofore accomplished. It will redound to the credit of the engineering profession if the Institute lends itself to their encouragement and perfection. For the present let us assist our national welfare by advocating the wider use of those fuels derived from a lump of coal by distillation for reasons of economy, efficiency, expediency and hygiene.

VETERINARY MEDICINE AND CHEMISTRY

At the 60th annual convention of the American Veterinary Medical Association, held at the Mount Royal Hotel, Montreal, at the end of August, Professor Charles Porcher, delegate of the French Republic, referred to the close relationship of veterinary medicine and chemistry, showing how the two must go hand in hand in the best interests of humanity. He said in part: "With respect to alimentary chemistry, every day milk, meat and canned goods offer difficult problems to solve. It is not only in your capacity of chemists that you shall have to study them. It is as bacteriologists as well. Furthermore, it is exactly because your studies on microbiology are greatly developed that certain problems, more delicate perhaps and more specially chemical, will receive from your investigation the necessary enlightenment when your studies have been completed in chemistry. The great advancement in our profession tends to make us important agents in hygiene in general."

A Rapid Means for the Determination of Quartz Content of Feldspar*

By M. C. BOOZE AND A. A. KLEIN, *Norton Company Research Laboratories*

THE commercial grades of feldspar as milled by practically all producers to-day contain considerable quantities of quartz. The removal of even a large part of the quartz is so difficult that we cannot expect to obtain a product with less than 10% present and in many cases the content will be as high as 30 to 35%.

This condition has probably been reached in recent years, the producer having worked out his purer deposits and is now being forced to turn to the more impure ones. Except in rare cases the quartz crystals are so intermingled with those of feldspar that complete removal of the former is practically impossible.

The determination of the quartz content by chemical analysis requires too much time to be practical where it is desirable to test shipments before unloading and is only satisfactory where decomposition products or accessory minerals other than quartz are absent.

The effect of the quartz is largely to dilute the feldspar. While it does affect the softening point, a softening point determination is not sufficiently accurate for the determination of the amount of quartz present nor the variation in amount between shipments.

Since feldspar is largely used in ceramic bodies to which free silica is intentionally added, the presence of quartz is usually not objectionable. The variation in quartz content, however, is equivalent to changes in composition of the body and should be avoided.

The method which has been devised for the determination of the amount of quartz depends, for its success, upon the difference in optical properties between feldspar glass, and quartz. The optical constants of the crystalline alkali feldspars and quartz may be so alike that the two are difficult of quantitative separation microscopically. Since there is a considerable difference between the temperatures at which feldspar and quartz lose their crystallinity, it is easily possible to fuse the one without affecting the physical state of the other. When this is accomplished it becomes an easy matter to distinguish between them microscopically.

In the practical application of the method therefore, a sample of the feldspar containing quartz is heated rapidly to a point where the feldspar becomes a glass without appreciably affecting the quartz either by fusion or by solution. The fusion when cold is crushed and a portion of the powder immersed in a liquid or resin of the proper index of refraction, *e.g.*, clove oil, ethylene bromide or Canada balsam and an estimate made of the relative amounts of feldspar glass and quartz.

In order that more accurate determinations might be made, a quantity of pure feldspar was obtained by careful selection and fusions were made of mixtures of this feldspar, with known quantities of quartz. By comparison with the known samples the quantities of quartz in unknown samples may be readily and accurately determined.

In the successful application of this method it is of course necessary to completely fuse the feldspar without dissolving an appreciable quantity of quartz. Time required for the test is also an important factor where tests are run on incoming shipments. To determine the limits for the proper heat treatment, fusions were made at cones 9, 10, 11 and 12, each being made in a pot furnace using city gas and air at 12 pounds pressure. The interior diameter of the furnace was approximately eight by 10 inches high. In some cases the fusions were in the shape of standard cones and in other cases were made in alundum crucibles approximately one inch in diameter by one and one-half inches high.

The data on these runs are as follows:—

Cone 9 tip touching cone 10 started in 2-hour burn with no soak. New Hampshire feldspar contained 10 to 15% of crystalline feldspar. Maine feldspar also indicated considerable quantities of unmelted feldspar. In neither case was there a noticeable amount of quartz solution.

Index of refraction of glass from New Hampshire feldspar = 1.486±.001.

Index of refraction of glass from Maine feldspar = 1.488±.001.

Cone 9 tip touching in 1¼ hours with a 15-minute soak. New Hampshire feldspar indicated 10% of quartz with no quartz solution. From 3 to 5% of crystalline feldspar was present. Maine feldspar indicated 30% of quartz. About 5% of crystalline feldspar was present.

Cone 10 tip touching in 1¾ hours with a 15-minute soak. New Hampshire feldspar showed a trace of crystalline feldspar but there was none evident in Maine feldspar.

There was no evidence of quartz solution.

Index of refraction of glass from New Hampshire feldspar = 1.486±.001.

Index of refraction of glass from Maine feldspar = 1.488±.001.

Cone 11 tip touching in 1½ hours and soaked for 15 minutes. There was no crystalline feldspar present in either the New Hampshire or Maine samples nor a noticeable amount of quartz solution.

Index of refraction of glass from New Hampshire feldspar = 1.486±.001.

Index of refraction of glass from Maine feldspar = 1.488+.001.

Cone 11 tip touching in 1½ hours and soaked for 30 minutes. The data here were the same as in the previous run, there being no measurable quartz solution from the longer soak.

Index of refraction of glass from New Hampshire feldspar = 1.486±.001.

Index of refraction of glass from Maine feldspar = 1.488±.001.

Cone 12 tip touching in 1¾ hours and soaked for 15 minutes. The data here indicated no more quartz solution than for the lower heat treatments. There was no crystalline feldspar present in either case.

Index of refraction of glass from New Hampshire feldspar = 1.486±.001.

Index of refraction of glass from Maine feldspar = 1.488±.001.

It is evident that cone 11 is the minimum for bringing about complete fusion in a heat treatment of approximately two hours. The length of soak determines the completeness of the fusion as does also the size of the sample. Crystalline feldspar has been observed when cone 12 was put down flat in one hour with no soak. A crucible larger than one inch to one and a quarter inches in diameter should not be used and the amount of charge should not be over 20 grams. A heat treatment corresponding to cone 12, down in 1½ hours, with a 15-minute soak is recommended as being the least liable to give erroneous results.

This heat treatment will suffice for a feldspar high in potash as well as one containing approximately equal percentages of potash and soda. On analysis the compositions of the Maine and New Hampshire feldspar used, indicated 30% of quartz for the former and 10% for the latter by the method of fusion and microscopic examination.

As stated above the success of the test depends upon the fact that the alkali feldspars upon being heated sufficiently to become a glass do not return readily to their original crystalline state. The fusion takes place at a heat treatment which is too low to permit of any solution of quartz in the feldspar glass, as indicated by Klein.

Obviously the distinction between isotropic feldspar glass and crystalline quartz is easily accomplished with the polarizing microscope since with polarized light and crossed nicols the former appears black opaque and the latter shows intererfence colors.

*Presented before the American Ceramic Society, February, 1923.

The test is carried out as follows: The fused product is pulverized and the powder passed through small screens clothed with No. 10 and No. 21 standard silk cloth, the product passing through the No. 10 and retained on No. 21 being tested. The 100 and 200-mesh standard cement screens can be substituted. This operation is done merely to provide a convenient and fairly uniform grain size for examination at a magnification of about 100 diameters.

A slide is prepared by immersing a small amount of the grain in one of the above-mentioned liquids and viewed first in ordinary light by removing the upper nicol prism then in polarized light by inserting it. In ordinary light the total amount of material in the field of vision is seen and in polarized light can be noted the amount of transparent material (quartz). Rotate the stage at least through 45° so that substantially all the quartz grains can be seen in some position or other. If a quartz grain is orientated exactly perpendicular to its "C" crystallographic axis it will remain black on rotation but the very small amount of grains thus orientated has in our experience no effect on the result since any error is well within the accuracy of this method. Quartz grains not so orientated will vary in color from dark gray through white to yellow.

If it is not necessary to determine the amount of quartz but merely to be assured of the uniformity of feldspars it remains only to prepare a permanent slide of a standard sample which shall be compared with subsequent products. Permanent slides are prepared by mounting the grains in a medium which becomes solid on standing, such as Canada balsam.

If it is desirable to know the amount of quartz present a sample of feldspar substantially free from quartz should be procured and to this known amounts of quartz added. Fusions of these mixtures will serve as reference points and permanent slides prepared from them can be compared as indicated with feldspars whose quartz contents are desired.

The ease and rapidity with which these comparisons can be made naturally depend upon the skill and technique acquired by repeated examinations. It is necessary to emphasize, however, that neither knowledge of polarized light nor of petrographic methods is required.

The method requires no elaborate equipment, the most expensive item being the simplest form of a polarizing microscope. Where only an ordinary microscope is available the two nicol prisms can be bought separately and fitted on without much trouble. In addition the following items are necessary: Clove oil, Canada balsam, 2 sieves, microscope slides and cover glasses.

DOMINION METALLURGICAL CO., TORONTO, TO DEVELOP CHROME ORES

It has been announced by Mr. Leighton McCarthy, Toronto, that the Dominion Metallurgical Company, Limited, has recently completed the purchase of important chrome ore and other mineral deposits in Africa and elsewhere in the British Colonies.

The Dominion Metallurgical Company is associated with the Electro Metallurgical Company of Canada, Limited, which has large manufacturing works at Welland, Ontario. The same interests in control of the Dominion Mines and Quarries, Limited, of Canada, own several chrome deposits in Quebec and operate large quarries at Killarney and East Neebish. Extensive exploration work and surveys are also being made in Canada and elsewhere for the purpose of locating further chrome properties to meet the expected increased demand for this ore and its products from the steel and allied industries growing out of recent developments in the art of manufacturing stainless steel, rustless iron and other products.

INDUSTRY NEEDS TECHNICAL LEADERS

Industrialists and Educators Confer Over Problem of Engineering Training to Fill Vacancies

Spurred by the fact that the need of industry in the United States for trained young men to become leaders is far surpassing the ability of the nation's technical schools to graduate men of this calibre, a committee of eminent industrialists and educators is holding a series of conferences in New York to seek a remedy for the difficulty. They are confronted by the little-understood necessity of filling, by 1930, at least 200,000 new positions of responsibility in industry, whereas there are available in the technical schools at present only about 50,000 students. Enrolment in these schools in 1920, when the first of the graduates aiming to be the future leaders in industry took up study, was 51,908, and to-day the enrolment is only 52,290.

This committee of business and educational leaders has been organized by the National Industrial Conference Board into a joint conference committee on engineering education, and it includes men distinguished in the fields of education and industry. The first autumn session has just concluded preliminary conferences at the headquarters of the National Industrial Conference Board at 10 East Thirty-ninth Street.

Some surprising figures and facts were made public after the meeting regarding the heavy drafts which industry will make in the next few years on the technical schools of the country. In a report just made public, the committee says:—

"What is likely to be the situation in 1930? American industry may need 400,000 more persons for positions of responsibility in 1930 than it used in 1920. This is in addition to the replacements necessary. The reason for this growth in demand for experts and leaders is the change of methods by which industrial work is being performed, which change consists mainly in the development of corporations, in the increasing use of machinery, power and other labor-saving devices and in the elaboration of methods of control in production and distribution. Mass production greatly increases the amount of product per worker, but requires a relatively larger increase in the proportion of planners and administrators.

"These facts and figures demonstrate that both the normal progress in industrial methods and the approaching new competitive conditions will call for a more decided change than ever before in the quality and number of trained experts and leaders."

"The big problem," says the Joint Committee's statement, "is to adapt the education of those who are to direct industry to the ever-changing conditions of industry itself. The needs of the next generation must be considered in the educational plans of to-day."

A survey of the educational facilities of the country for meeting this great and hitherto unheralded need shows, the committee finds, that they are limited. At present the technical schools of the United States are turning out about 9,000 graduates a year and, in industry at present, less than twenty per cent. of those who now plan and administer the productive work of the nation are graduates of any college at all.

A call has been issued from the National Industrial Conference Board to the Joint Committee on Engineering Education for the second session of the industrialists in full committee. Among the Committee members are S. P. Bush, president, Buckeye Steel Castings Company, Columbus, Ohio; Howard E. Coffin, vice-president, Hudson Motor Car Company, Detroit; Col. T. C. Dickson, commandant, Watertown, Mass., U. S. Arsenal; Howard Elliott, chairman, Northern Pacific Railroad, New York; E. M. Herr, president, Westinghouse Electric & Manufacturing Co., Pittsburgh; William H. Nichols, chairman, Allied Chemical & Dye Corporation, New York; Henry D. Sharpe, Brown & Sharpe Manufacturing Co., Providence, R.I.; A. H. Rogers, Rogers, Mayer & Ball, New York; Prof. R. H. Fernald, University of Pennsylvania; Dean H. J. Hughes, Harvard

Engineering School; Prof. D. C. Jackson, Massachusetts Institute of Technology; President F. W. McNair, Michigan College of Mines; Prof. J. W. Roe, New York University; Dean Herman Schneider, University of Cincinnati; Frederick P. Fish, chairman of the National Industrial Conference Board, Magnus W. Alexander, managing director of the board, and others.

INTARVIN FAT—A NEW FOOD FOR DIABETICS

The placing of this product on the market in quantity is due to the idea of Dr. Max Kahn, the Chemistry of Dr. H. O. Nolan, F.I.C., the chemical engineering of Dr. Ralph H. McKee, and the faith of Mr. D. A. Ansbacher that these gentlemen could produce results, if funds were provided. The story of Intarvin Fat is most interesting. Dr. Nolan is a chemist, and a medical research worker. Strange to say, he has been, until the last few years, associated with near-Eastern Governments, and much of his work has been of an executive nature.

Reduced to simple language, Intarvin Fat differs from natural fats only in that its acid contains an odd number of carbon atoms. Natural fats are even-numbered. Its use eliminates acidosis in diabetes. Food chemists are familiar with the beta oxidation theory of Knoop, who pointed out that, in the digestion of fats, after the first splitting of the glycerine from the fatty acid, the acid was oxidized by the removal of two carbon atoms at each step. Now, if an odd-numbered compound were available, the chances were that it would not produce on digestion an acid containing four carbon atoms such as acetoacetic acid. The problem became one involving the production in quantity of compounds one CH_2 greater or less than those that occurred naturally. Hence came the chemistry and the chemical engineering. A tasteless mineral oil is added to what is essentially glyceryl margarate.

This new fat may be introduced to the diet with almost any ordinary food, and is being produced by the Intarvin Co., Inc., of Long Island City, at the rate of 600 pounds per month. At present, the cost is $9.00 a pound, but this will be reduced with greater production. From three to six ounces per day is a normal feeding.

"Chemical Engineering Catalog"

Eighth Annual Edition, 1923, published by Chemical Catalog Company, Inc., 19 East 24th St., New York City, N.Y.

This annual publication is the official standard work of reference for chemical engineers, plant superintendents, purchasing agents, operating engineers, and others who specify and buy equipment and materials in the industries using chemical processes. It is published under the supervision of an official committee appointed by the American Institute of Chemical Engineers, the American Chemical Society, and the Society of Chemical Industry, and is edited by Francis M. Turner, Jr., a graduate in chemistry of the University of Toronto and well known to many Canadian chemists.

Since the first edition appeared eight years ago, it has come to be regarded by many hundreds of chemical engineers as something absolutely essential to their work. To those who possibly are not familiar with the book, the title "Catalog" may be somewhat misleading. It is not a catalog in the general sense of the word, but is rather a work of reference and information on equipment and materials. The publishers have excluded all general claims, exaggerated statements and display material on the part of the companies taking space in the book, and have used every effort to encourage the publication in the catalog pages of precise data, such as specifications, construction details, tables of sizes and capacities, and specific uses of equipment and materials.

One hundred and ninety pages are devoted to a classified index of equipment and materials that is indeed a model of completeness. One can here find almost instantly, by alphabetical order, any piece of equipment or chemical with the name of the manufacturing company together with the page number of the companies using space in the catalog.

The Technical and Scientific Book Section of the Catalog has been largely extended in this edition, more than 1300 being listed and described, giving almost a complete list of available books in English dealing with chemical and allied subjects.

The type size of each page is 10 x 7 inches and there are 1056 pages in the book. It is printed on the best of book paper, strongly bound, with durable leather covering, and is exceedingly well illustrated.

The catalog is not sold, but is leased (at $3.50 in Canada) to chemists, engineers, works managers, university professors, and libraries. To all others a charge of $10.00 is made.

PRODUCTION OF NON-METALLICS, CANADA, 1922

The Dominion Bureau of Statistics, Ottawa, has issued the following finally revised statistics on the production of Non-metallic Minerals in Canada during 1922.

With the exception of arsenic there were no outstanding differences between the production of 1922 and the previous year of the commodities listed in the table below as miscellaneous non-metallic minerals.

The production of arsenic in 1922 was 2,576 tons, an increase of 1,085 tons, or 42% when compared with 1921. Large quantities of this commodity are being used in the United States for insecticides which are found to be particularly effective in combatting the boll weevil, an insect which has caused great damage in the cotton districts during recent years.

		1922	
		Quantity	Value $
Actinolite	Tons	50	575
Arsenic (white) produced from Canadian ores	"	2,576	321,037
Barytes	"	289	9,537
Chromite	"	767	11,503
Feldspar	"	27,727	248,402
Fluorspar	"	4,503	102,138
Graphite	"	597	31,353
Grindstones	"	1,005	43,742
Magnesite	"	2,849	76,294
Magnesium sulphate	"	1,021	24,017
Manganese	"	73	2,044
Mica	"	3,349	152,263
Mineral water	Gals.	221,433	14,220
Natro-Alunite	Tons	50	2,500
Iron oxides	"	7,285	110,608
Peat	"	3,000	14,500
Phosphate	"	190	1,796
Pyrites	"	18,143	74,303
Quartz	"	109,947	208,598
Sodium carbonate	"	202	3,027
Sodium sulphate	"	504	11,980
Talc	"	13,195	188,458
Tripolite	"	219	5,781
Total			$1,658,676

REFUGE CHAMBERS FOR MINES

The United States Bureau of Mines has advocated that refuge chambers be built in the main sections of mines. After an explosion or during a mine fire men might retreat to these chambers and close themselves in until help arrived. The usefulness of these places has been discussed in Technical Paper 24 of the bureau, entitled "Mine Fires." Such chambers should be provided with drinking water, canned food, and compressed air. Small refuge chambers have been established in some of the coal mines in the Central States, where there have been many explosions during shot-firing time, and these chambers have saved lives.

Silica Cement*

THE proper selection of a cement or fire clay for laying up brick is just as important as the selection of the brick itself. One of the most important characteristics of silica brick is its ability to resist deformation under load at any temperature below its softening point. The use of a mortar which may decrease the refractoriness of the brick is injurious, because it defeats the purpose for which silica brick is used.

Composition of Silica Cement

Silica cement is usually manufactured of ground silica brick bats with sufficient plastic clay added to give it the proper plasticity and bonding qualities. It is essential that the plastic clay used shall be refractory, of fairly high silica content and that only a sufficient quantity be added to produce the desired results, which is usually about 25%. The proportioning of the clay and bats is usually done mechanically as they go to the mixers, and they are then ground together in the mill to the desired fineness.

Some manufacturers substitute raw or unburned ganister rock for part of the silica bats in approximately the following proportions:—

50% silica bats,
25% gainster rocks,
25% plastic clay.

The fact that ganister rock expands on heating, thus tending to offset the shrinkage of the plastic clay, is the chief reason for its use. It is claimed, with some basis, that the use of the rock also increases the refractoriness of the cement.

The two things to be considered in the manufacture of silica cement are—quality and proportion of plastic clay, and fineness of grind. If ganister rock is used, the amount necessary to offset the shrinkage of the plastic clay should be fixed.

Requirements

Refractoriness is the main requisite of a good silica cement. It should not soften at the working temperatures even though it does not flow out of the joints. Even in low temperature requirements, where binding properties are important and where it may be justifiable to decrease the refractoriness, it is necessary to consider the safety factor, to allow for abnormal conditions. The lower the fusion point of the cement the more detrimental will be the chemical action on the silica brick caused by its fusion.

Next to refractoriness in importance comes plasticity. Silica cement should be plastic enough so that it may spread easily and smoothly with a trowel. Should not settle out or become sandy if left standing for several hours, and should possess sufficient bonding qualities to stay in place and hold the brickwork together during the drying and heating-up periods. The percentage of plastic clay to be used is dependent upon its character and quality. The clay should be highly silicious and refractory, having a fusion point of about Orton cone 28—1635°C.

As the working qualities of the cement are also in measure dependent upon the fineness of grind, it is advisable to have it ground fine so that it will spread easily and not require such a high percentage of plastic clay to make it stand up in the mortar boxes.

Testing

On account of the great possibility of the cement varying in quality, it is generally advisable to test each carload. A sample should be taken at the manufacturers' plant before shipment so that tests will be completed and the quality determined by the time the car arrives.

*Abstract of paper given before the American Ceramic Society, February, 1923, by E. N. McGee, Semet Solvay Company, Syracuse, N.Y.

The following tests are usually employed:

Refractoriness—

The refractory quality is most readily obtained by determining the fusion point as described in method C 24—20 of the American Society for Testing Materials. This test is accurate, simple in operation and quickly determined. The fusion point of first quality silica cement should not fall below Orton cone 28—1635°C. The softening point of silica brick lies between Orton cones 31 and 32, but the addition of plastic clay decreases this to some extent, depending upon the percentage used and its refractoriness. Obviously the lower the refractoriness of the plastic clay the less that can be used without producing a cement which fluxes at a temperature below that which actual practice has proved satisfactory.

Fineness—

Fineness may be determined by sifting the cement dry in a sieve—shaking machine of the Ro-top type for ten minutes. Semet-Solvay specifications require that the cement shall approximately all pass a 30-mesh screen conforming to the United States Bureau of Standards Specifications.

Analysis—

In a special case like silica cement, a chemical analysis is of considerable value because it not only shows the composition, but also can be used in determining the percentages of plastic clay, which the cement contains, and thus indirectly gives an indication of the plasticity of the cement. The calculation of the percentage of plastic clay is based upon the alumina contents of the silica cement and the plastic clay. If the plastic clay does not vary greatly in quality, this method will give fairly accurate results. The following proportion is used to obtain the percentage of clay.

Per cent. Al_2O_3 of the clay: (% Al_2O_3 of the cement—1%) :: 100% clay : x% clay in the cement.

One per cent. Al_2O_3 (introduced by the silica bats) is subtracted from the Al_2O_3 of the cement. The remainder is the Al_2O_3 obtained from the clay.

The following chemical analysis of a plastic clay and silica cements, with their actual softening point determinations, illustrate the use made of these tests.

		Silica cement		
	Plastic clay	1	2	3
SiO_2	63.96%	84.62%	83.40%	82.00%
Al_2O_3	23.64	7 .56	8.90	10.00
Fe_2O_3	2.32	3.12	2.61	2.40
CaO	.24	1.45	1.55	1.35
MgO	.58	.18	.19	.28
Alkalies	3.73	1.33	1.35	1.54
Loss on ignition	5.88	2.02	2.30	2.62
Total	100.35	100.28	100.35	100.00
Fusion point in Cones	20	26	20–26	19
Per cent. Plastic Clay by Al_2O_3 calculation		27.7	33.5	38.1

Example—23.64 : 6.56 :: 100 : x
23.64 x = 6.56
x = 27.7% Plastic Clay.

Plasticity—

If the fusion point and fineness tests prove satisfactory it is then only necessary to know whether or not the cement contains a sufficient amount of plastic clay to give it the proper working and bonding qualities. The pail test used by Semet-Solvay Company is simple and adequate. The cement is mixed with water to the consistency of dipping mortar and allowed to stand eighteen hours. If, after that time it has not settled so as to cake in the bottom of the pail, experience shows that it will spread smoothly and easily, not give trouble by settling in the mortar boxes.

Another simple test is made by buttering the cement between the flat surfaces of two nine-inch straight brick, allowing it to thoroughly air-dry. The cement should then support the lower brick when the upper is suspended with the joint in a horizontal plane.

Bonding Qualities

The bonding qualities of silica cement with silica brick are very slight even at high temperatures. If the cement is buttered between two silica nine-inch brick and subjected to a temperature of 1450°C. in a test furnace for seventy-two hours, the bricks will be found to be fairly well bonded together while hot, but when they have been allowed to cool the bond will be very slight. If, however, these bricks are heated under a pressure of fifteen pounds per square inch in the same manner, and then allowed to cool while still under this pressure, the bricks will be found to be fairly well bonded together. The bonding qualities of silica cement are then very slight unless subjected to considerable pressure or unless the cement is of a sufficiently low refractory quality to cause it to soften or vitrify at the operating temperatures. In the latter case this softening of the cement causes it to attack the brick and a hard bond is formed which will not allow the bricks to be separated without breaking them. The bonding property however, should not be obtained at the expense of the refractoriness, because it seriously impairs the life of the brickwork.

If it is necessary, however, it has been found that the bonding qualities can be greatly improved, without reducing the refractoriness, merely by the addition of a certain amount of molasses to the water when mixing. Other organic substances might be just as suitable, but molasses is comparatively cheap and gives very satisfactory results. It is not absorbed as readily by the brick as water, and consequently this may cause the cement to fill the pores and then produce a better bond. The burning out of the molasses may also leave carbonaceous matter which tends to bond the cement and brick. Tests have proved that a high refractory cement mixed with part molasses and part water will give a hard bond when heated at 1450°C. for seventy-two hours without being subjected to pressure. In fact the bricks had to be cut apart with a chisel and hammer. They broke through the cement, leaving part of the cement bonded to each brick. Even at a temperature between 900° and 1000° C. a fair bond was produced, which required a considerable pull to break, and as before the break was through the cement. Several tests were made using cements from different manufacturers so that there might be no chance for error, and in each case at temperatures ranging between 1000° and 1450°C. the difference in the bond produced with and without the molasses, was very marked. Fusion point determinations made on a cement with molasses added showed the same refractoriness as without. It is also a curious fact that silica cement or ground silica bats, if mixed with molasses and applied to a hot silica brick surface, will adhere firmly to the bricks, and consequently it can be used to fill any cracks or crevices, which may have developed in the brickwork after service.

PRODUCTION OF CRUDE PETROLEUM, CANADA, 1922

The Dominion Bureau of Statistics issues the following finally revised statistics on the production of crude petroleum in Canada during 1922.

The production of crude petroleum in Canada in 1922 amounted to 179,068 barrels having a sales value of $520,073. Government bounties on these sales amounted to $91,103, making the total value $611,176 to the producers. In 1921, the production was 187,541 barrels, having a total value of $641,533. The average market value per barrel in 1922 was $2.90 while in 1921 it was $2.92.

DEATH OF DR. STEINMETZ

The death occurred on October 26th of Dr. Charles Steinmetz, celebrated electrician, who had for many years been connected with the General Electric Company as director of their research department.

How to Apply Aniline Dyes in a Paper Mill*

By L. Mann

Although quite a number of aniline dyes possess such excellent solubility that it appears perfectly safe to add them to the paper stock in dry form, this is not good practice.

For example, Auramine or Acid Orange will generally cause no harm when employed in this manner, and in many board and wrapping paper mills even Chrysoidine is added to the beater stock in the dry state with very satisfactory results. However, this proves nothing, for at any time a batch of either of these colors which for some reason will not dissolve quite properly, might be received by the mill and if used in the dry form would result in a spoiled run of paper. This is especially liable to occur when buying is done from several sources. This would more than offset any advantages gained by the slight saving in work when using the color dry.

Therefore it should be clearly understood by those entrusted with the application of aniline dyes in the paper mill that outside of a few exceptional cases, aniline dyes should be dissolved and strained before being added to the beater stock. On papers where cleanliness is considered essential, no exception to this rule should be allowed even though practical experience might single out certain types of aniline dyes as perfectly safe when used in the dry state.

Dissolving the Dye

The three groups of aniline dyes most widely employed on paper stock are basic, acid, and direct dyes. The method of dissolving these will vary slightly with the type of color used.

A general rule which should be most strictly followed is to dissolve and strain each color separately, regardless of the group to which it belongs. The reason for this is that acid and basic as well as direct and basic dyes will precipitate each other into a more or less insoluble residue, when brought together in one solution. This would obliterate a great deal or all of the coloring strength of the individual dyes, cause a correspondingly larger consumption of dyestuff, and increase the possibility of specks in the finished sheet in spite of other precautions. Although it is obvious that no harm would result from using several dyes of one group together in a single solution, the chances are that if this general rule is not strictly adhered to, dyes of different groups will also be brought into one solution. The results would be both annoying and costly.

The water used for dissolving most dyes should be as near the boiling point as possible, in order to obtain an easy solution. Three to four gallons of water are necessary for every pound of dye to be dissolved.

Of the three groups, basic dyes require the greatest care in dissolving. Where only hard water is available, the addition of acetic acid or vinegar will facilitate the solution of the dye. The acid or vinegar used for this purpose should be equal in quantity to the amount of the dye to be dissolved, both being stirred into a paste and then the boiling water applied.

Auramine, Chrysoidine, and Bismark Brown should not be dissolved in boiling water. For these three types the temperature of the water should not be more than 160°F. to secure the best results.

Acid dyes, as a rule, are of very good solubility in soft as well as hard water, and no special precautions are necessary to correct alkaline conditions in the water. Direct dyes are also easily soluble. Here the effect of the hardness of the water can be corrected by the addition of soda ash, equal to the amount of color to be dissolved.

Entering the Dye

For the same reason which makes it necessary to separately dissolve each dye, it is essential that each dye be separately added to the beater stock in the proper order.

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Assuming that dyes of all three groups were employed in one shade, the direct dye would be added first, then the acid dye, and lastly, the basic dye. The power of the basic dye to precipitate dyes of the two other groups, requires its addition after the others. The rosin size may be added before or after the color. The alum, however, should be entered last of all; and only after the addition of the alum should the final inspection of the stock as to shade take place.

The Color Room

In this connection, it seems in order to make a few suggestions on the proper equipment of a color room, where the dyes should be weighed out, dissolved, and strained. It is essential that the room used for this purpose be clean, dry, and well lighted. This room should be equipped for the storage of large containers on platforms, and small containers on shelves, of such dyes as are actually in use. Reserve stock should be stored elsewhere, containers being brought to the color room as needed.

A set of two scales is recommended, one weighing accurately ounces and fractions of ounces, the other for larger amounts. The color room should also contain equipment for making up the solution. This consists of two clean barrels or containers, with a suitable attachment for heating water, and the necessary number of wooden, galvanized iron or copper pails. Strainers for the dye solution are easily provided by using old paper machine wires except when dyeing the very highest grades of paper. In dyeing these grades it is advisable to strain the solution as finely as possible, using muslin or cheese cloth instead of wire cloth. Where large amounts of color have to be dissolved at one time, a clean barrel sawn in two will provide two excellent large containers for this purpose.

LIQUID OXYGEN EXPLOSIVES

A liquid-oxygen explosive as made today consists of a permeable organic container, filled with the absorbent material, which is soaked in liquid oxygen immediately before use, state C. A. Taylor and W. H. Rinkenbach, assistant explosives chemists of the United States Department of the Interior, in Bulletin 219, recently issued by the Bureau of Mines. This cartridge is inserted in the borehole and exploded either by an electirc detonator or by a special safety fuse and cap.

An inactive absorbing material, such as kieselguhr or aluminum oxide, is sometimes added. The proportions of the various ingredients of the cartridge should be such that they will absorb sufficient or more than sufficient liquid oxygen to completely oxidize the combustible matter present. Kieselguhr is unaffected, but is supposed to assist in the propagation of the explosion wave.

The cartridge is usually a tube of paper toweling, which serves as an insulator and as a combustible. A permeable envelope of a material such as cheese cloth is so constructed that it will fit into the insulator. This envelope holds the absorbent and combustible materials and also serves as a combustible. The material within the envelope may be classified as (1) absorptive and (2) combustible.

The absorbents that do not take part in the chemical action are usually kieselguhr (diatomaceous earth) and aluminum oxide, although the latter has not been used much. The combustibles sometimes serve also as absorbents, as was originally intended. Wood pulp, cotton, lampblack, coal dust, wood charcoal, and cork charcoal serve a double purpose, whereas crude oil, paraffin, other liquid hydrocarbons, and napthalene are combustibles only.

The Bread and Cake Bakers' Association are requesting support from the Ontario Government for the establishment of a School of Baking to be established in connection with the Ontario Agricultural College, Guelph.

Chemical Society News

INTERESTING DEVELOPMENT ARISING THROUGH THE FORMATION OF THE "CANADIAN ASSOCIATION OF OFFICIAL ANALYSTS"

In previous issues letters have been published from individuals discussing phases of this development. What any Department of the Dominion Government may arrange with individual chemists in their private capacity is not necessarily the affair of the profession at large, provided nothing of a general injurious nature results. If true and fair economy is desired and can be accomplished, the chemical profession is as anxious as any other to assist the Government. In the instance under consideration it is doubted by many if practical economies can be credited. From an entirely different standpoint other questions have become involved that are certainly of general interest. They may be considered from the angle of professional chemical ethics. If as a result our general professional conscience is stimulated and the incident causes the development of some concrete guiding principles to which all classes of chemists can subscribe, much good may be done.

Following an exchange of correspondence between the Dominion Seed Commissioner, Mr. G. H. Clark, and the Secretary of the Canadian Institute of Chemistry, Mr. L. E. Westman, which dealt in a non-controversial manner with the questions involved, some worthy representative of the press interviewed the Commissioner and from an examination of this correspondence evolved the following remarkable article under a two-column head. This appeared in Ottawa papers under date of October 13th. The treatment was deemed to be misleading and in order that chemists in general throughout the Dominion might have available more details of fact and opinion the article appearing in the press and a reply are submitted below.

(From "Ottawa Citizen," October 13th)

BALL PLAYERS' SALARY CONSIDERED AS EXCESSIVE FOR A MERE CHEMIST BY DOMINION SEED COMMISSIONER

Letter of Mr. G. H. Clark in Controversy in Chemical Circles Arising out of Appointment of "Official Analysts" by Government to Examine Feeding Stuffs and Fertilizers. Fee Held too Large by Official

"If this estimate of Mr. Grattan's be approximately correct, then the per diem revenue of the chemists, if based on your recommendation of twenty-five dollars per sample, would approach almost to that of a professional ball player, which you would agree might be considered as extravagant by the interested public."

This paragraph is taken from a letter written by G. N. Clark, Dominion seed commissioner, in a controversy which has been going on recently in chemical circles and between chemists and the Dominion government. The discussion grew out of the action of the Department of Agriculture in appointing certain "official analysts" recently to examine feeding stuffs and fertilizers.

The controversy has had to do somewhat with the formation by these "official analysts" of "The Canadian Association of Official Analysts," but has centered largely around the fee paid by the government for the work. This fee, which was fixed at a conference between the "official analysts"—who are large attached to universities and other institutions of learning—and government officials, is fifteen dollars for a complete analysis.

In the course of the controversy, L. E. Westman, of Toronto, secretary of the Canadian Institute of Chemistry, wrote to the seed commissioner, protesting against the low fees paid by the government.

A Good Day's Work

"I think," said he in a second letter to Mr. Clark, "that the point of the whole question, is that the fee given to any analyst you appoint who is a university professor should be quite a little above that which would be considered satisfactory by a commercial laboratory. Perhaps $25 would be much nearer the mark than $15, which I understand is now offered for a complete analysis."

It was to this letter that the seed commissioner made the reply quoted at the opening of this despatch. He quoted in support of his statement an opinion given by George E. Grattan, a chemist in the service of the department.

"All of the official chemists who are doing work for us," said Mr. Clark, "are able as a rule to group a dozen or so samples, each requiring similar work and all to be analyzed at the same time. Mr. Grattan tells me that under these conditions a competent chemist with an assistant may average as many as twelve samples per diem and still not have more arduous work than the average of our Canadian people who are willing to work."

This paragraph is immediately followed in the letter of the seed commissioner by the comparison between the pay of chemists and of professional ball players.

(Reply to above article)

To the Editor,
"Ottawa Citizen,"
Ottawa, Ontario.

Dear Sir:—

In your issue of October 13th, an article appeared under the heading "Ball Player's Salary Considered as Excessive for a Mere Chemist." In playing up a single sentence in some correspondence you have managed to give the whole matter a tone that is misleading. If the question is worthy of space for treatment in the style adopted by you. I trust you will find a place for essential facts.

For many years the analytical work arising through the collection of samples of Fertilizers and Feeding Stuffs was carried on by Public Analysts attached to the Inland Revenue Department Laboratories. These laboratories are now under the direction of the Department of Public Health. It would have been natural to suppose that the Department of Agriculture would arrange to look after the routine analytical work arising from the administration of the Fertilizer and Feeding Stuffs Acts. The Department of Agriculture has laboratories and the Department of Health has four laboratories outside of Ottawa in charge of Public Analysts who have analyzed these products for years. The Dominion Seed Commissioner partly because of the difficulty of inter-department laboratory co-operation and possibly on the grounds of economy and speed, and it might even be for the reason that no established government laboratory is very anxious for the work, decided to use not only Government laboratories, but those available at certain selected universities and agricultural colleges. These were the University of New Brunswick, Queen's University, University of Toronto, University of Saskatchewan and the University of Alberta. The plan carried out was to appoint in all cases, except the University of Toronto, the Head of the Department of Chemistry as an "Official Analyst" under these Acts. It was found, however, that the fee for analysis set under the Act was $5.00 per sample. This made no difference to full time Civil Servants as they were on a salary basis, but for University Professors this fee was considered by them to be inadequate. It was never meant to be anything but a nominal amount that could be charged by the Government if necessary. To make it an industrial standard was a different matter. The appointments were made on this basis with a promise that the fee would be raised to $15.00 per sample. The gentlemen appointed under these Acts met at Ottawa and on the strength of their appointment organized of their own accord the "Canadian Association of Official Analysts," although they were officials only in respect to two Acts calling for well-known routine work. This choice of name was not necessary as neither the Department nor the Acts recognize this Association.

The objections to this whole procedure as far as the chemical profession at large is concerned are:—

1. It is a generally accepted principle that routine analytical work undertaken for the Government should be carried on by Chemists of the Government. This is based on much practical experience.
2. The Dominion Government has the necessary laboratories and Chemists, and the samples under consideration may be shipped any distance without deterioration.
3. The use of university laboratories for routine analytical work of this order is not desirable. As a general rule a university professor should not accept anlytical work at a nominal fee when his salary and practically all of his anlytical equipment is otherwise provided.
4. Provided universities were agreeable, the Dominion Government should not consider securing a type of economy not generally available.
5. Heads of Departments of Chemistry of Canadian Universities are presumed to be teachers and research workers, rather than analytical chemists carrying on or supervising work that apparently is not desired in Government laboratories.
6. The creation of a "Canadian Association of Official Analysts" restricted to a few Chemists who happen to be analyzing fertilizers and feeding stuffs in an official capacity is not in line with the general impression created by the use of such a name. It would be misleading to the professional chemists of Canada as a whole and might be very confusing to the public.
7. The setting up of a small group of chemists, some of them rather inexperienced in such work, and the conderation of official methods by this group to the total exclusion of consulting analytical chemists who operate laboratories where such work is carried on for the public, possibly by equally experienced men, is not generally desirable.
8. Any nominal fee stated in an Act of the Dominion Government should not be taken even as the basis of the proper value to be put on such work as a commercial transaction.

While it may be true that a dentist, for example, might make a fortune extracting teeth at twenty-five cents each under conditions where everything connected with his work was provided almost free and he had an unlimited number of teeth arrayed before him, it does not follow that this is to be considered a fair professional charge. To stand continually in readiness to examine a few samples of fertilizers with a high degree of accuracy and go into a court where the only important person in the case from one standpoint is the Chemist; to accept all the responsibility and find all the materials to carry on the work is not the simple or unimportant matter that the Dominion Seed Commissioner has been led to believe. To do all the work in duplicate or triplicate and check it with skill is surely worth $25.00 in times like these, particularly if the individual happens to be the Head of a Department of Chemistry of a Canadian University.

Personally we take issue with the Seed Commissioner because we believe such a Chemist's time is worth more than

that of any ball player. The Government should recognize by the size of the cheques that the chief responsibility for the proper working of any act involving such inspection rests upon the skill and accuracy of the professional chemist employed. While the writer happens to be the Secretary of the Canadian Institute of Chemistry which is an organization including Government, University and Industrial Chemists, this is not to be taken as an official letter of the Institute, but rather a summary of such casual opinion as has been brought to his personal attention. The Institute has discussed the matter, but not officially.

If the Dominion Seed Commissioner has any volume of analytical work of this nature, a couple of temporary appointments of recent graduate chemists would seem to be a very obvious solution.

Toronto, October 18th, 1923. L. E. WESTMAN.

While the above indicates only a newspaper correspondence attitude, where it is perhaps necessary to place all arguments on one side, in order to produce force, there are points that are valuable about the arrangement, which were, no doubt, in the minds of those who developed the idea.

In Canada, agricultural schools in particular, and universities in general, are very much interested in agricultural developments. In the agricultural colleges, work of this kind would introduce students in a practical way to a knowledge of the quality of the fertilizers and feeding stuffs available. If the staff has the time, and the facilities, to direct students in such analytical work, it would be valuable experience. In universities, it is essential that professors have as many points of contact as possible with industry. It has been charged against them that they are out of contact with industrial problems. If, by meeting specific problems in a consulting and analytical capacity, they keep up a proper contact, it is reflected in their teaching ability.

The co-ordination of government and university laboratories in any matter will be to their mutual advantage; and if any branch of the government desires the assistance of most careful workers, they should expect to find them connected with the universities. The university professor is supposed to be willing, at all times, to come to the assistance of everyone, and carry more than his share of public duty.

When the government desired to secure analysts who would lend prestige to their work, it was very natural that they should first consider university men.

Chemists have very little of the past to guide them. They have no rules printed for their game, and it is hardly to be wondered at that Governments, and the public generally, are confused, at times, when dealing with them. It is only by such occurrences that opinions form, and standards show themselves.

DRS. BANTING AND MACLEOD AWARDED NOBEL PRIZE IN MEDICINE

The Nobel prize in Medicine for 1923 has been awarded to Drs. F. G. Banting and J. J. R. MacLeod of Toronto for their work on the discovery of insulin. This is the first time that the award has been given to a Canadian. Nobel, the Swedish scientist and inventor of dynamite, who died in 1896 bequeathed $9,000,000 for the establishment of a fund, the interest on which should be distributed yearly to those who had most contributed to the benefit of mankind during the year immediately preceding the awards. Prizes are awarded annually in Physics, Chemistry, Medicine, Literature and Peace, and the value of each prize is on an average, $40,000.

A Study in Structure as Applied to the Paint Industry

MR. Henry Green, of the Research Laboratory of the New Jersey Zinc Co., at Palmerton, Pa., gave a most valuable lecture on this subject, before the Toronto Section of the Society of Chemical Industry, on October 23rd.

He developed the results of his experimental work on the structure of paints, and indicated the necessity for a fundamental conception of the principles controlling the interaction of paint materials. With these set forth, many of the everyday, practical troubles and problems may be solved by the paint technologist.

Some typical problems arising in the Paint industries, which might be understood by the application of principles of structure, are:

1. Why should not all pigments of the same chemical constitution and particle size, have equal oil absorption?

2. Why should two pigments, which analyze the same, make paints of different consistencies, when ground in the same vehicle?

3. Why should it be possible to have two paints of like "viscosities," one of which will flow readily, while the other will not?

4. Why do some paints smooth out to an enamel-like finish, when applied, while others, apparently the same viscosity, retain brush marks?

5. Why do the highly-viscous oils make easier flowing paints than the more fluid vehicles?

6. Why do some paints thicken on ageing, while others thin?

7. Why do small traces of certain oils greatly alter the consistency of paints and pastes?

8. Why does it require more energy to incorporate some pigments into oils than others, especially if the particle size is the same?

9. Why do some paints settle in the can to a tough, hard, rubbery layer, while others stay suspended indefinitely?

A knowledge of the principles necessary to explain these problems assists in a solution of similar questions arising in other industries, particularly the rubber field.

When more than one phase is present, we have heterogeneity, and at once structure must be considered, along with chemical constitution, almost all commodities are heterogeneous materials. Even in the simple metals, such as iron, nickel, copper, zinc and aluminium, we have heterogeneous products, depending on structure for their properties.

The microscope, in one or other of its forms, has been of the urmost aid to the investigator in studying structure. He can actually see the arrangement of the mixture. In studying the structure of the very finest particles, the ultra-violet microscope, with camera connection, has been most important. Here, by an arrangement of quartz lenses the transmission of light of short wave length is accomplished, and a resolving power secured that will show very easily the finest pigments such as gas black and the finest grain zinc oxide.

Paint is essentially a two-phase material—a suspension of finely-divided solids in a liquid vehicle. The simplicity of the structure may have caused it to be ignored by the paint investigator, and he is quite unaware of the great importance it is to his own work. This structure is not so simple as its mathematical representation would appear to make it. Pigment particles are neither spheres nor equal in size. In addition, they flocculate. The factors to be considered in paint structure are: average size of particle, shape of particle, uniformity of pigment, and the force of flocculation. These factors can be complicated by soap formation, through the fatty acid of the vehicle combining with the metal base of the pigment. Gelatinization of the vehicle may also occur. There may also be an appreciable difference between the static and dynamic surface tensions, forming temporary set. These primary and secondary factors

may be combined in a variety of ways, making paint structure very complex.

The microscope and direct measurement are used to study the size and shape of particles and the uniformity of the pigment.

The question of viscosity must be studied to understand the action involved in the flow of plastic paint materials through a capillary tube. By a specially-designed instrument, consisting of a reservoir of paint, to which any pressure could be applied, and from which a fine capillary tube was led under a microscope, studies in flow were made. It was found that at low pressure a pure slippage of the paint took place in the tube, while at higher pressure a true flow of the telescopic type resulted. If curves are plotted, showing pressure and flow, they are found to have two branches, with a break or intermediate curve between them. So that, as pressure rose, the shape of the viscosity curve altered to conform with the different nature of the flow. If there had been no pure slippage, under low pressure, there would have been no lower branch of the curve, and no yield value. This led to the conception that yield value depends entirely on the force of flocculation.

While the line of reasoning in the argument may not have been perfect, it has been definitely proven by experiment that flocculation produces yield value and therefore plasticity. When a minute trace of gum arabic is worked into a zinc oxide water paste, it becomes exceedingly fluid. The microscope shows that the structure change has been a deflocculation of the zinc oxide.

Flocculation is due to residual surface tensions in the pigment vehicle interfaces, or is a matter of wetting. In connection with wetting, the absorption of impurities, especially gases, on the pigment surface, during manufacture very materially alters the wetting properties. These gases do not appear in the report of the chemist, and differences, where identical results should exist, may be due to such causes.

The intensity of the force of flocculation depends on the degree of wetting, but the amount of the force is directly proportional to the area of interfacial surface. The finer the pigment, the greater the specific surface, and so the greater the interfacial surface per unit volume of paint. Starting from this point, it is easy to conclude that, under such conditions, the yield value will be higher, and the mobility lower, when the particle size is decreased.

The Microscope has revealed four factors in regard to structure, size, shape, uniformity and flocculation.

Applying this knowledge to a few of the problems, it is evident that pigments of the same chemical constitution and particle size may not have equal oil absorption powers, because of absorbed gases and their influence on flocculation.

Considering paints of like viscosities, one flowing freely and the other not, it is essential to understand that the resistance of the paint to flow is determined by yield value, and mobility. These together determine the so-called paint viscosity, and it is quite possible to alter these factors in such a way that when combined, two paints may indicate the same viscosity, but one can have a higher yield value and a higher mobility than the other.

Settling in cans depends on the nature of the flocculation and the size of the particles.

During the lecture, a number of slides were shown, illustrating photomicrographic work, charts and instruments.

Following the lecture, a number of questions were asked. One of some interest related to the existence of any essential difference between barium sulphate and zinc sulphide, precipitated separately and then mixed. If particles of these, of the same degree of fineness as lithopone were mixed, it was considered doubtful if much difference in hiding power could be observed from that of lithopone. Something might be due to the fact that, under the microscope, the precipitated particles showed that, to some degree, they had come down, one on the other; but an appreciable percentage of lithopone particles apparently were chemical individuals in admixture.

The study indicated that these fine particles were crystalline, and not amorphous, and some doubt was cast on the probability that any true amorphous materials existed.

This was the first meeting of the year for this Section, and some 150 were present, including the representatives of many paint and varnish companies. Prof. J. T. Burt-Gerrans occupied the chair. Mr. M. L. Davies was elected to represent the Section in connection with arrangements for the meeting of the British Association for the advancement of Science, to be held in Toronto next September. Prof. R. Harcourt invited all members to come to Guelph for a special meeting, to be held about December 1st.

New Books Reviewed

"Industrial Filtration"

By Arthur Wright. Chemical Catalog Co., New York. 328 pp.

The subject is treated in three parts: (1) Theory of Filtration; (2) Mechanics of Filtration; (3) Filter Practice. The Theory of Filtration consists of a very practical discussion of general and particular cases, written in a way that allows the author to bring in, to the best advantage, his own experience, and the results of his observations. The steps of building-up the cake, washing, drying and discharging, are detailed.

There is a chapter on filter media. Under the mechanics of filtration, all the types of filters employed are thoroughly dealt with. Important considerations, related to filtering, but arising from other plant operations, complete a very valuable contribution to chemical engineering literature.

"The Chemical Resistance of Engineering Materials"

By M. L. Hamlin and F. M. Turner, Jr. Chemical Catalog Co., New York. 250 pages. Price $5.00

To know in advance is essential, and this book stresses a very important side of engineering work. It calls attention to the need of more extensive knowledge relating to the properties of various materials, and how they behave when brought together with chemicals in various concentrations.

Anyone building plants where chemicals are used will find this book a very helpful aid. The whole viewpoint of the authors is sufficiently unusual to mark the work as distinctly original. It is a gathering-up and bringing-together of a fund of chemical engineering data not otherwise readily available. In addition to this, the work is stimulating and designed to cause thought before major blunders are made.

A wealth of specific information is given for the majority of the industrial chemicals, and for the common and special materials from which equipment is made.

"The Determination of Hydrogen Ions"

(Second Edition) By W. Mansfield Clark. Williams & Williams, Ltd., Baltimore. 480 pages. Price $5 00

The second edition of this standard work has been re-written to some extent and contains a large number of new references. The work is again up to date, and covers the field thoroughly.

"Manufacture of Nitric Acid and Nitrates"

By Allen Cottrell. Gurney & Jackson, London. 36s. 454 pp.

This is Vol. VI of the General Series of Lunge, on Acids and Alkalis, and is a complete revision of previous work. Very complete details of latest developments are included, with much special information derived from war-time plant practice. The work will serve as a standard, and maintains the leadership set by the original author. There are definite sections dealing with the following general heads: Nitrate of Soda; Production

of Nitric Acid from Chili Saltpetre; Denitration of Waste or Mixed Acids; Mixed Acids; Physical and Chemical Properties; Industrial Nitrates; An Acid and Water Balance.

"Valence and the Structure of Atoms and Molecules"

By Gilbert N. Lewis. Chemical Catalog Co., New York. 172 pages. Price $3.00

This Monograph covers theories as they have been developed, and experimental evidence, as contributed by research. The whole is bound together and expounded by one who has contributed much himself, and is an expert teacher.

The Mineral Industry During 1922

(Vol. XXXI), By G. A. Roush and H. Butts. McGraw-Hill Co. New York. $10.00

A review, giving production and trade statistics for economic minerals. Recent advances in technology are included. Each chapter is written by an individual with special knowledge of the field.

"Centenary of the Alkali Industry"

The year 1823 saw the establishment of the alkali industry in the United Kingdom, by James Muspratt, at Liverpool. As a memorial to a century of development in the industry, the United Alkali Company, Liverpool, have issued a book of some seventy pages, containing an account of the progress made, and of the great difficulties overcome, in bringing the industry to its present technical perfection.

The industry was started upon the Le Blanc Process, and, in this connection, it is worth quoting one of the opening paragraphs of the book:—

"In 1923, the Le Blanc process is completely discarded; but the industry which was built upon it remains, still advancing, developing in ever new directions, demanding of those concerned in it the same qualities, judgment, audacity, and untiring labor demanded of the Muspratts, Gossages, Tennants, Gaskills and Deacons, a hundred years ago; but invoking still more urgently the devoted and unwearying search for the fundamental truths of science. By that way, and that way only, can progress be assured, whether in pure or applied science."

If an industry established for a century, and which has reached such a high plane of technical development, still regards research and science as of vital importance, what an object lesson it is to our own youthful industries, where, in many cases, science is still regarded as a sort of expensive toy and where too often immediate dividends are considered the important factor.

Undoubtedly the most interesting chapter in the book, from the chemist's viewpoint is "Le Blanc and After," by J. T. Conroy, B.Sc., the company's chief chemist. In this, Mr. Conroy outlines the technical development from 1823 to date, and describes a few of the many difficulties overcome.

Other chapters, all exceedingly interesting, and making pleasurable reading, are: "Personal Notes on James Muspratt," by his grandson, Dr. H. E. Muspratt. "The Origin of the United Alkali Company." by "One of its Founders"; "The Tyne Alkali Industry," by J. E. Davidson; "The Tennant Family," by T. W. Stuart; and the "World Significance of the Alkali Centenary."

It is indeed a very interesting book, particularly in its historical application. We wish to acknowledge our thanks to Mr. M. L. Davies of the Standard Chemical Company, Toronto, representative of the United Alkali Company, for a copy of this historical record.

The spring meeting of the American Electrochemical Society will take place at Philadelphia, April 24th, 25th and 26th, 1924. The feature of the meeting will be two symposia: "Recent Progress in Electrodeposition" and "Organic Electrochemistry."

PRIZE ESSAY CONTEST TO DEVELOP APPRECIATION OF CHEMISTRY AMONG STUDENTS

A prize essay contest of exceptional merit has recently been placed before the students of American high schools through the generosity of Mr. and Mrs. Francis P. Garvan. Six topics chosen with a view of developing an appreciation of the importance of chemistry have been selected by the committee in charge. Each state of the Union will have a first prize of a twenty dollar gold piece for the bestessay contributed in that state on each topic. From among the state winners a national committee will select the winners to receive the four-year scholarships at Yale or Vassar. These scholarships carry $500 a year and tuition, and were made possible through the generosity of Mr. and Mrs. Garvan. In order to give all contestants ready access to literature that will help them in their essays, Mr. Garvan has provided for the distribution of more than ten thousand sets of five books each to be sent to secondary schools both public and private without request. A number of sets will also be sent to public libraries.

The American Chemical Society has been given charge of the administration of the contests. The journal of the Society in commenting on the contest editorially says: "We all recognize that in the boys and girls lies our greatest opportunity to encourage chemistry. This does not mean that we expect all high and secondary school students to become chemists. It does mean that attention will be drawn to chemistry as a cultural study, that a wider view upon everyday affairs will be obtained, and that chemistry will be placed in the popular estimation, on a par with astronomy, for example, which has obtained a big hold upon the layman."

REPORTS RECEIVED

"Consumption of Prepared Non-metallic Minerals in Canada"—a special report giving the results of an investigation to determine the extent of the market in Canada for finely-ground non-metallic minerals, issued by the Dominion Bureau of Statistics, Ottawa. The investigation on which this report was issued was carried out under the direction of Mr. S. J. Cook, B.A., F.C.I.C., Chief of the Mining, Metallurigcal and Chemical Branch of the Bureau by Mr. A. C., Young, B.Sc., of the permanent staff. A very complete abstract of the report was given in the September issue of "Canadian Chemistry and Metallurgy, so that it is only necessary here to briefly point out those features of it that were not mentioned or at least detailed in our September issue.

The main feature of the Report are the excellent tables giving detailed information on practically every important factor concerning the industry. These are: Tables showing Imports into Canada, prepared non-metallics, the United States Customs Tariff, Items affecting non-metallics, consumption of prepared non-metallics by Canadian Industries, Tables showing Consumption of Non-metallics by individual or groups of industries such as "paint industry," "soap industry," etc., Consumption by Commodities.

All statistics and tables are fully elucidated, and the descriptive matter given, apart from the tables, is replete with much interesting data and important facts. It is a report that every chemist, superintendent, and executive, of companies using non-metallics of any kind would be well advised to read. For those contemplating the development of any of our non-metallic minerals the report will prove invaluable.

Mr. E. H. Cunningham-Craig in a paper presented recently to the Institution of Petroleum Technologists, England, reviewed the theories of the origin of petroleum. He concluded, that as a result of the work by Professor A. E. Flynn in Nova Scotia and others upon the gels separated from torbanites, the case for the origin of oil from vegetable matter had been completely established.

World Wide Chemical News

(Special Correspondence to Canadian Chemistry and Metallurgy from Our London Representative)

Satisfactory Export Trade in British Dyes

The output of German dyestuffs chemical has not yet been so much curtailed by the Ruhr occupation as has been generally believed. In fact the production of some works has been above normal and has been sufficient to enable the manufacturers to maintain their connections abroad. In spite of this the export trade in British dyestuffs has been very satisfactory and has averaged more than 12,000 cwts per month for the third quarter of the year, as compared with 5,000 cwts in pre-war times. The average price of British exported dyestuffs has fallen during the year from £12 per cwt in January to about £8 in August, as compared with the pre-war figure of £3. In this connection it is interesting to learn that a renewed demand has arisen in India and China for British-made indigo and for certain vat colors.

Sulphuric Acid Industry

A review of the sulphuric acid industry shows that the plant capacity now in operation is about 62% compared with 48% twelve months ago, but it is still too low for really economical manufacture. Of the output 25% is normally consumed by the sulphate of ammonia manufacturers and 18% by metal pickling and hydrochloric acid manufacturers. The superphosphate industry normally consumes about 25% of the output, and it is the desperate state of this branch of the chemical industry that hampers the return of sulphuric acid manufacture to normal proportions. Depreciated European currencies and the wartime development of superphosphate manufacturing in countries formerly customers of British houses are the two causes of a situation which the British manufacturers consider to be a menace to the actual existence of their industry.

A feature of the sulphuric acid industry worthy of note is the increased use of sulphur as a raw material instead of pyrites, the amount consumed being about 45,000 tons during the past twelve months as compared with 16,000 tons for the previous year. Altogether the production of sulphuric acid for the twelve months ended June 30th, and calculated to 70% acid, amounted to 1,225,000 tons compared with 985,000 tons for the previous twelve months.

British Iron and Steel Production

The production of pig iron in the United Kingdom in September, amounted to 558,600 tons, as compared with 599,800 tons in August and with 430,300 tons in September, 1922. The furnaces in blast at the end of the month numbered 190, a further decrease of six during the month and a decline of 33 since the end of May. The output of steel ingots and castings amounted to 695,100 tons, compared with 567,500 tons in August and 555,900 tons in September, 1922.

Developments in Use of Stainless Steel

Great developments continue to take place in Great Britain in the use and manufacture of stainless steel. For example, one of the most important of recent developments is in connection with the manufacture of hydraulic pump rams and rods. The requirements for this work are very severe, including resistance to rust and corrosion, hardness, and high tensile strength and toughness. All kinds of materials are at present used for the purpose—cast iron, chilled iron, forged carbon steel, nickel steel, gunmetal, phosphor bronze, delta metal, and monel metal—and it is claimed that stainless steel is much superior to most of these.

Stainless steel is also highly suitable for the valves and seatings of pumps of every description, as well as for valves and spindles.

It seems probable also that stainless steel will very shortly find an extensive outlet in the manufacture of high-pressure steam valves and fittings in place of the very expensive nickcopper alloys now used.

Death of Dr. Harker

Dr. John Allen Harker, F.R.S., O.B.E., who died on October 10th, after a short illness, aged 53, did valuable work during the war on a number of scientific problems, especially those connected with nitrogen and oxygen, and in recent months took a great interest in the development of the Casale system of fixed nitrogen production, which he foresaw might be of particular value to countries like the Dominion of Canada having ample supplies of hydro-electric power.

Serious Condition of German Chemical Export Trade

According to reports from Hamburg, German exports of various kinds of chemicals during the six months to the end of September fell off by seventy-five per cent., and it is doubted whether the trade can much longer compete in foreign markets. The transition to a gold mark basis has now been completed, and the gold mark quotations for potash products were raised by thirty per cent. at the end of August, export prices being about 15% lower than those for the domestic market.

Germany Retains Large Export Trade in Dyestuffs

A statistical report on the German coal-tar chemical industry has recently been issued by the United States Department of Commerce, and the conclusions to be drawn from this survey are briefly summarized as follows:—

The pre-war pre-eminence of Germany in the coal-tar chemical industry had been largely regained by the beginning of 1923. The Chinese, Japanese, and Indian markets were largely recovered. The French occupation of the Ruhr has seriously affected this industry, as most of the plants producing coal-tar crudes, intermediates and dyes are located in the seized territory. Despite this setback the transfer of stocks and orders to plants in the unoccupied territory and the day and night working of these plants to full capacity has resulted in the retention of a large export trade. Unemployment allowances, the extension of credits by the Government and the co-operation of the dye plants in the unoccupied territory have resulted in a large production of coal-tar products than might be expected under present conditions. The curtailment of the production of crude has meant larger imports of these commodities. If, as is claimed by several German manufacturers, some of the by-product coke ovens have been shut down, the consequences will be felt a long time for to come. German competition in the dye markets of the world will still be a dominant force to be reckoned with, no matter what the final outcome of the French occupation of the Ruhr may be.

Polish Alcohol Industry

Since April last, 1,223 alcohol distilleries have been working in Poland, employing 9,500 hands. The probable production of pure alcohol in the present season is estimated at 65,000,000 litres in rural and 20,000,000 litres in industrial distilleries.

Belgian Glass Trade Improves

The weakness of the Belgian franc is reacting on the sheet glass and cut glass export trade, and fresh orders are coming to hand from a number of countries whose purchases were reduced in 1922.

British Malaya Large Importer of Acetic Acid

Canadian exporters of acetic acid will no doubt be interested in the following statement regarding the Malayan market just issued in London by the Malay States Information Agency:—

With the exception of native rubber holdings and the possible exception of one or two large estates, all rubber latex produced

in British Malaya is coagulated with acetic acid. During the war, when supplies of acetic acid were difficult to obtain, sulphuric acid came into general use. This acid is cheaper than acetic, but its use has been condemned by the Department of Agriculture of the Straits Settlements and Federated Malay States and also by the Rubber Growers' Association.

From the following table it will be seen that the value of acetic acid imports has risen enormously since 1920. The sources from which the acid has been imported are interesting. In 1921, Canada furnished almost fifty per cent. of the supply, but she has now ceased from competition in the market. The bulk of the acid is now supplied by European Continental countries. Details as to the respective quantities exported by the different countries of the Continent in 1922 and 1923 are not yet available, but in 1921 the Netherlands and Germany were the only two European Continental countries exporting the acid to Malaya. The value of Japanese acetic acid rose enormously in 1922, but has fallen again during the first half of the current year. The following is a table of the values of acetic acid imported into British Malaya in 1921, 1922 and the first half of 1923, showing countries of origin:—

	1921	1922	1923 (January to June)
	£	£	£
United Kingdom	390	7,920	4,792
British Possessions	11,332	540	Nil
Continent of Europe	3,819	80,347	52,213
United States	5,565	751	1,017
Japan	2,366	29,121	4,450
Other countries	Nil	245	Nil
Total	23,472	118,924	62,472

Possibilities of Camphor Production in India

As a result of investigations conducted by the Forest Research Institute, Dehra Dun, it is concluded that camphor may be easily cultivated in all parts of India with a rainfall of forty inches and over, but that as a commercial enterprise its cultivation should not be attempted outside the tropical areas, and that even in the latter areas the financial returns are likely to be small while camphor remains about its present price.

East Indian Market for Ammonia Gas

The new uses to which rubber is being placed, require the latex to be shipped in fluid form instead of sheets. Anhydrous ammonia is the constituent used to prepare the latex for export, and is being placed on the Singapore market in the form of ammonia gas, 100 per cent., put up in steel cylinders containing approximately 100 pounds.

Australia Exporting Arsenic

The Jibbenbar, Queensland, Australia, State arsenic mine is now producing at the rate of about fifty tons per month, according to a report to the U.S. Department of Commerce. This is much more than equal to the Australian demand for arsenic. The demand from America has greatly improved the market, and now the Queensland State mine is sending about twenty tons of its output to that country.

American Dye Makers Lose Chinese Markets to Germans

American dye manufacturers have lost the Hong Kong market and control has passed into the hands of German manufacturers, according to a report to the U.S. Department of Commerce. American manufacturers who secured and held the bulk of the South China trade during the war were unable to maintain their position when the Hong Kong Government in 1920 prohibited the importation of dyestuffs from all countries except Great Britain. When the embargo was partially removed, and American dyes were again admitted, American manufacturers, who had kept no large stocks in the district, had lost the market, and before there was an opportunity to regain lost ground, the embargo was removed altogether, and German dyes, which were well-known and enjoyed an excellent reputation, again flooded the market at prices below those of other foreign dyestuffs.

Chinese Fertilizer Imports

The following figures show the imports of chemical fertilizers into Hong Kong in 1922:—From the United Kingdom, 4,097 tons; Canada, 255; North China, 1,359; Japan, 3,800; Philippines, 1; United States, 5,773; South America, 100; other countries, 25; total, 15,410. The fertilizer most in demand is sulphate of ammonia.

Soda Ash War in Japan

The Japanese soda ash market is now placed completely under the control of British producers. Japanese producers who have thus far held a corner in the market are reduced to a helpless condition. Importers of Magadi soda are virtually driven off the market.

The supply of American soda ash was stopped some time ago and since then the import market has been shared by British soda ash producers and Magadi soda importers. During the war years, there were three Japanese alkali works that produced soda ash. One was compelled to close down with the restoration of peace. Another was also compelled to stop production recently. These three have thus far supplied roughly 100,000 tons annually. The Asahi Glass Co., which is the only Japanese plant producing soda ash now, is, however, compelled to change its policy. It will no longer fight British producers, but will buy their soda ash at the price reduced by them for competition.

JUSTICE RIDDELL ON EXPERT EVIDENCE

At a joint meeting of the Engineering Societies of Toronto including the Canadian Institute of Chemistry and the Society of Chemical Industry on November 1st, the Hon. Justice Riddell gave an address on "Expert Evidence."

The speaker claimed kinship with the Engineers having graduated in an engineering course from the University of Toronto in 1876. Justice Riddell is known as a remarkably finished and clear speaker, and on this occasion delighted his audience with the way he unfolded the finer points of his subject by discourse and example. He pointed out the development and nature of the present courts and distinguished expert evidence from lay evidence on the basis of the difference between something actually and personally known, and something that was an opinion only.

He suggested some points to be remembered in giving expert evidence: (1) Give the examining lawyer some credit for a knowledge, for the time at least, of the particular points involved. (2) Do not try to show all you know. (3) Tell the truth and make the truth tell. (4) Avoid drawing attention to yourself, keep it on your evidence. (5) If you cannot answer Yes or No, appeal to the bench. (6) Bring your proof and standard authorities with you. (7) Collect your fee before you are sworn if you wish to make sure of it without any trouble.

PERSONAL

Mr. J. C. Richardson, formerly of The Grasselli Chemical Company, Limited, Toronto, is now associated with T. E. O'Reilly, Limited, chemical importers and distributors, Toronto.

Mining and Metallurgy in British Columbia

(Special Correspondence to Canadian Chemistry and Metallurgy.)

Proposed Steel Industry Lacks Government Guarantee

Judging by cable reports, the Coast Range Steel Corporation scheme for inaugurating an iron and steel industry in British Columbia seems to be meeting with more enthusiasm in London than in British Columbia. Another meeting was arranged at B. C. House, London, at which some of the principal designers and constructors of iron and steel and coke-oven plants met our only lady member of parliament, Mary Ellen Smith, and assured her, as already they had assured the Hon. John Hart, Minister of Finance for British Columbia that if the Provincial Government would guarantee one-third of the twelve-million-dollar bond issue, the British Trade Facilities Committee would also guarantee one-third of the issue, but, as a guarantee of good faith, it was essential that the Provincial Government should be the first to act. Premier Mackenzie King, it is said, is the next person to be invited to meet the British manufacturers, who will try to persuade him to promise a similar guarantee from the Dominion Government. When H. J. Landahl, the promotor of the scheme, approached the Provincial Government, more than a year ago, he is said to have assured the Government that the British Trade Facilities Committee and the Dominion Government already had promised to guarantee one-third of the bonds. Now, it appears, none of the Governments have promised to guarantee any part of them. Locally, the scheme is meeting with a good deal of disfavor. Many people openly express the opinion that only those who provide the machinery and those who sell the stock are likely to reap any permanent benefit from the enterprise, and if the three Governments guarantee the bonds they, ultimately are likely to be saddled with the plant.

Research on Iron Production by Granby and Consolidated

While the promoters of the Coast Range Steel Corporation are bending their energies on the securing of guarantees for a large capitalization others are devoting their attention to laboratory research. H. S. Munroe, managing director of the Granby Consolidated Mining. Smelting & Power Company, has just come out with the statement that his company has produced, and is producing, iron in a small reverberatory furnace from the slags of the copper blast-furnaces at Anyox. He emphasizes the fact that as yet this has not reached the commercial stage, but the technical staff at the smelter is working hard in the hope that ultimately it will. The Granby company is producing some 400 tons of slag, containing on an average fifty-two per cent. of iron, daily. In the past this has been a waste product, in the near future Mr. Munroe hopes it may be utilized in supplying iron and steel for use in British Columbia.

More than a year ago, S. G. Blaylock, managing-director of the Consolidated Mining & Smelting Company, announced that pure iron had been made in the Trail laboratories from the tailing from the Sullivan mine ore. Since that time the technical staff at Trail has been busily employed in the erection of the new mill at the Sullivan mine and in re-modelling the plant at Trail to cope with the increased output of lead and zinc ore from the Sullivan mine, and has had little time to continue its researches on the production of iron from Sullivan mine tailing. Now, however, that the new mill is in operation and the plant at Trail is running smoothly, we may expect to hear more about the production of iron. The tailing from the Sullivan mine and the slag from the Anyox smelter are capable of producing 200,000 tons of metallic iron annually, provided processes can be found for its commercial extraction. The cost of mining already has been paid on this material, and, in the case of the slag, some heat could be conserved probably by treating the hot slag as it comes from the copper blast furnaces. There will be those, of course, who will say these processes are untried, and, therefore, unworthy of consideration, but at least they have the advantage that the companies that are backing them are tried concerns and neither company is seeking governmental guarantee of a twelve-million dollar bond issue.

Word has been received from the owners in Tacoma to the effect that the steel plant and rolling mills at Port Moody are to be re-started at once, after a prolonged period of idleness. The plant contains an electric and open-hearth furnace for re-melting scrap and machinery for fabricating the product.

The Premier Gold Mining Company disbursed a dividend of $400,000 for the third quarter of the year, bringing the total disbursed since December, 1921, up to $4,450,000. Howe Sound Mines, the holding company for Britannia Mining & Smelting Company, disbursed $199,208 and Silversmith Mines, $25,000 for the same period.

Developments at Alice Arm

A New York syndicate has bonded the Dolly Varden and Wolf mines, the railway, wharf, and all equipment. The Dolly Varden produced nearly 900,000 ounces of silver in 1921 and 1922, its owner, however, bent all its energies on production and practically none on development, with the inevitable result of financial failure, and the mine reverted to its original owner, George Wingfield, who held a mortgage on it. It is well equipped with mining machinery, but a concentrator is needed.

A new vein has been struck in the tunnel above the Baldy tunnel at the Esperanza mine. The vein is ten feet wide and three feet of it on the foot-wall is high-grade shipping ore. The remainder is milling ore. The high-grade is being sacked.

A twenty-five foot vein has been traced for 4,500 feet at the Sunrise group. It carries lenses and stringers of high-grade silver-lead ore, and it is probable that a large portion of the vein will prove to be of milling grade. As yet, this vein has been opened only by trenching. A camp is to be built in the spring and a tunnel driven to open the vein at depth.

Portland Canal District

The Granby company has equipped the Outsider mine, thirty-five miles south of Stewart on the Portland Canal, and shipping operations will be under way before this is set in type. The ore is highly siliceous and averages about three per cent. of copper. This will make the second big shipper in the district. The mine is only seven miles in an air line from the Anyox smelter, but the ore has to be shipped between fifty and sixty miles by water.

Some rich ore has been uncovered at the Georgia River group, down the Portland Canal. Recent samplings have ranged from 8 to 120 ounces of gold and 7 to 46 ounces of silver per ton. The vein, which is only a few inches wide, has been stripped for twenty-five feet.

The Indian Mines Corporation, the shares of which are held mainly in Ontario and Quebec, has let a contract for 2,000 feet of diamond drilling. It is expected that the result of this work will enable the directors to decide the size of the mill that is to be erected on the property next spring. A considerable body of milling ore has been developed by two adit levels.

Drum Lummon Mine to Re-open

Negotiations have been practically completed for the taking over of the Drum Lummon mine, at Hartley Bay, by a New York syndicate. Work was stopped at this mine last May,

owing to the syndicate that had it under option being unable to fulfill its financial obligations. Some $90,000 has been spent in development and equipment, the latter including a wharf and tramway. When work was stopped it was said that only a small amount more capital was required to place the mine on a producing basis.

Survey of Arsenic Resources

George Hanson, of the Geological Survey, was instructed to make a special investigation into the arsenic resources of the Province, and the report of his investigations will appear in the Summary Report for the present year. In the meantime he has given out the information that he estimates roughly that 50,000 tons of arsenical pyrite may be obtained from Henderson, Rocher de Boule, Nine Mile, and Dome Mountains. All of which are within comparatively easy reach of the Grand Trunk Pacific branch of the Canadian National Railways. The mines at Henderson and Dome mountains are being worked by the Federal Mining & Smelting Company for their precious metal content.

Mining Institute Condemns Steel Subsidy

At a meeting of the Canadian Institute of Mining and Metallurgy, held at Trail on October 17th, the report of executive committee appointed to investigate the plans and objects of the Coast Range Steel Corporation was adopted by a unanimous vote. The committee in its report stated that efforts to obtain information from H. J. Landahl, the promoter of the scheme, had been met with insulting correspondence, charging, among other things, that the mental capacity of the Institute was too limited to comprehend the company's plans. The committee emphatically condemned the proposal for a Government subsidy of any form for the company.

NEW RESEARCH DIRECTOR FOR B.D.C.

Professor W. H. Perkin has been appointed adviser to the headquarters research staff of the British Dyestuffs Corporation, Limited, in succession to Professor Arthur G. Green, who recently resigned. He is Waynflete Professor of Chemistry and a Fellow of Magdalen College, Oxford, where for some time he has been controller of the British Dyestuffs Corporation Research Colony.

CANADA'S MINING INDUSTRY IN HEALTHY STATE

The report of the Dominion Bureau of Statistics covering the mineral production of Canada for the first half of this year show that an appreciable advance has been made in output and value as compared with the first six months of 1922.

The outstanding feature was the recovery in the production of nickel and copper. The re-opening of the smelters and refineries operated by the International Nickel Company and the British America Nickel Corporation resulted in a production of nickel during the first six months of the year which was nearly seven times greater than the production in the first half of last year, and the output of copper was more than double the quantity produced in the corresponding period last year. The copper output during the half-year was greater than the total production during the calendar year 1922; the nickel output was also nearly sixty per cent. greater than the entire quantity made during the twelve months ending December, 1922.

The gold mining industry is in a satisfactory condition, although the production shows a slight falling off from that of the corresponding period last year. This was due entirely to the prolonged power shortage in Porcupine this spring, a dry fall followed by a late breakup of ice on the lakes and rivers proving a severe handicap to the power companies. With increased crushing capacities, and one new producer assured, it is expected that the 1923 total will equal that of 1922. The gold production of Canada for the first six months of 1923 amounted to 530,402 fine ounces valued at $10,964,382.

Silver production also showed a slight falling off when compared with that of the same period in 1922. However, the outlook for this industry is particularly bright for the latter part of the year. Large shipments during the summer from the new silver mining districts of the Yukon will undoubtedly make up for any declines in production from the older camps. During the first six months 8,336,946 ounces valued at $5,506,469 were produced contrasted with 8,905,454 ounces valued at $5,997,199 in 1922.

The other metals all showed increases in production compared with the same period last year.

The section dealing with coal contains comparative tables on the more important statistics pertaining to this commodity. The production amounted to 8,722,205 tons valued at $38,188,343 as compared with 6,205,288 tons valued at $26,993,498 for the first six months of 1922. The increase amounts to 2,516,917 tons valued at $11,194,845 or 40.5% in quantity and 41.5% in value.

Increased production is general throughout the list of non-metallics, the most important increase being in asbestos. To the end of June, 99,042 tons were sold by producers for $3,574,762 as compared with 54,846 tons and $1,894,232 during the same period in 1922.

Copies of the report may be had on application to the Dominion Bureau of Statistics.

INCREASE IN CANADIAN LIME PRODUCTION

The Dominion Bureau of Statistics has issued finally revised statistics on the production of Lime in Canada during 1922.

The total value of lime produced in Canada in 1922 was $3,165,005, an increase of 12% over the 1921 production which amounted to $2,781,197. The total production comprised 7,698,028 bushels of quicklime valued at $2,622,726 and 44,623 tons of hydrated lime valued at $542,279. About 29% more quicklime was sold in 1922 than in the preceding year, but the value of these sales was only 12% higher. Likewise, the production of hydrated lime increased 39% in quantity and only 24% in value.

The average price received for a bushel of quicklime in 1922 was thirty-four cents as compared with forty cents in 1921; hydrated lime averaged $12.15 per ton in 1922 as against $13.65 in 1921.

PRODUCTION OF LIME IN CANADA IN 1922, SHOWING PURPOSE FOR WHICH SOLD OR USED

Supplied to the Industries Shown Below	Quicklime		Hydrated Lime	
	Bushels	Total Sell'g Value at Kiln $	Tons	Total Sell'g Value at Kiln $
Building and whitewashing	1,334,769	450,861	34,500	440,433
Chemical works	1,772,786	605,547	2,194	18,697
Smelters	169,329	69,450	.....	.....
Pulp and paper mills	2,044,777	498,550	3,173	32,513
Sugar refineries	275,685	100,821	.....	.....
Tanneries	43,979	15,145	3	37
Agriculture (fertilizers)	38,671	4,450	1,083	10,384
Dealers (uses unspecified)	1,363,309	621,493	3,418	37,948
Others	654,723	256,409	252	2,267
Total sold or used	7,698,028	2,622,726	44,623	542,279

Industry and Trade

Industrial Developments----Trade and Company News----Financial Notes----Patents----Market Review and Prices

INDUSTRIAL DEVELOPMENTS

CAMDEN EAST, ONT.—The Lennox Paper Mills, Ltd., are now operating the plant of the Specialty Paper Mills producing book, envelope and offset papers.

PETERBOROUGH, ONT.—The factory of the De Laval Co., Ltd., here is being enlarged to accommodate a pickling and tinning plant.

ST. BONIFACE, MAN.—The Dominion Tar and Chemical Co., Ltd., are constructing a tar distilling and chemical manufacturing plant, at a cost of approximately $250,000.

CORBYVILLE, ONT.—The Canadian Industrial Alcohol Co., Ltd., are re-building their plant, recently destroyed by fire. Seven new buildings are under construction, the total cost of which will reach $175,000.

TORONTO, ONT.—The Nujol Laboratories, of Bayonne, N.J., have engaged Messrs. Fred. J. Whitlow & Co., as their Canadian agents. The product will be imported in bulk and prepared for the Canadian market at 165 Dufferin St.

SASKATOON, SASK.—Eight concrete tanks, with a capacity of 250,000 bushels, are being constructed by the Quaker Oats Co.

REGINA, SASK.—The Regina Vinegar Company is being established in this city.

CHILLIWACK, B.C.—The Maitland Portland Cement Co. will build a $1,000,000 plant.

WINNIPEG, MAN.—Becker & Co., largest handlers of wood pulp in the world, are arranging to construct a pulp mill which will utilize Western straw, instead of pulpwood.

PORT ARTHUR, ONT.—A combination of interests associated with St. Lawrence Pulp & Paper Co., and the Guaranty Investment Corporation, of Montreal, have taken over the Nipigon Pulp & Fibre Mill, at Nipigon, which will re-open next month.

QUEBEC, P.Q.—The St. Regis Pulp & Paper Co. has purchased lands from the Canadian National Railways, at Cape Rouge, P.Q., where it will erect a $4,000,000 pulp mill, employing 800 men. They expect to handle from forty to fifty million cords of pulpwood yearly.

The Laurentide Co., Ltd. have purchased the Lake St. Joseph Timber Limits, consisting of 350 square miles, for approximately $1,000,000.

KINGSTON, ONT.—The Davis Tannery here was recently destroyed by fire, with a loss of $100,000.

DUNDAS, ONT.—Kaustine Co., Ltd., manufacturers of sewage disposal systems, septic tanks, water pressure systems, etc., are erecting a new factory at an estimated cost of $15,000, which will enable them to double their capacity.

TORONTO, ONT.—The Toronto Brick Co., whose plant was burned on July 16th, have completed the erection of their new plant at a cost of over $60,000. It will have a capacity of 50,000 bricks per day.

CALGARY, ALTA.—The new refinery of the Imperial Oil Co. has been completed. It will provide steady employment to over 200 men.

SHERBROOKE, QUE.—The Paramount Rubber Co. have purchased the plant of the Regal Rubber Co. They will manufacture hot water bags, rubber balls, plumbing supplies, etc.

NIAGARA FALLS, ONT.—The Dominion Canners' factory at St. Davids, near here, was destroyed by fire recently, with a loss of $200,000, partly covered by insurance.

MOOSE JAW, SASK.—A field of sodium carbonate of a high grade has been discovered near here.

WINNIPEG, MAN.—An American Company is planning to plant some 10,000 acres with sugar beets, next year, and establish a plant for the manufacture of sugar, in Winnipeg.

SAULT STE. MARIE, ONT.—Five gold claims have been staked near Michijikio Lake, 25 miles west of Superior.

ST. JOHN, N.B.—The Stephen Brick Co. are reported to have secured a contract from a New York firm for a million bricks.

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HALIFAX, N.S.—The surface plant of Messrs. Chambers & McKay, owners of the Malagash salt mine on Northumberland Strait, which was recently destroyed by fire, has been rebuilt, and the mine and mill are once more in operation.

COBOURG, ONT.—The construction of the largest vinegar plant in Canada has recently been completed by the Douglas Packing Co. The vats have a capacity of approximately 1,000 tons.

VANCOUVER, B.C.—A firm from Seattle has erected a new clay product factory in South Vancouver, where flower pots are being manufactured. The plant (which has a capacity of 30,000 flower pots at one baking) utilizes clay and sand from Port Hanley and the Fraser River.

PORT HOPE, ONT.—The Bush English China Company has secured land and buildings here, where they will make china tableware, from clays imported from England.

NORTHERN ONTARIO DEVELOPMENTS

The Premier Mine, Northern Ontario, is installing a plant with a capacity of one thousand tons daily. Their present plant has a capacity of two hundred tons per day.

One of the richest gold grade stopes in Northern Ontario is being developed by Lake Shore. This stope is 360 feet long and averages eight feet in width. The ore runs over $75 a ton.

The T. and N.O. Railway is planning to construct a branch line, possibly twenty-two miles long, to serve the South Lorrain silver district. The estimated cost of this line is $700,000.

The new mill at Keeley Mine, which has been treating 80 tons per day, is now ready to handle 140 tons. This mine is achieving some remarkable results. During the course of 75 feet of drifting some 400,000 ounces of silver were removed from one of their veins.

The Burnside shaft of the Tough-Oakes Mines has been sunk from 800 foot level to 1,000. The new mill of this mine is able to handle 200 tons of ore daily.

A new Company, to be known as the Lakeside-Lorrain, has been incorporated to operate in the South Lorrain silver district.

The profits of the Dome Mines for the six months of the fiscal year ended September 30th, 1923, amounted to $1,005,215 as compared with $970,297 for the last fiscal period.

It is expected that, when the 200-ton mill of the Night Hawk Peninsular Mine, near Porcupine, is in operation, this new gold mine will be producing at least $60.00 a month.

A development of considerable importance in the Porcupine District is the opening-up of No. 10 vein of the Vipond Mine. The ore is of a good grade, averaging over $10 a ton, and an area of some 500 feet wide has yet to be prospected.

The McIntyre-Porcupine Gold Mines, Ltd. have purchased the Platt Vetern claim, east of their property. This claim consists of some 160 acres, and the purchase price was in the neighborhood of $500,000.

The Tonopah Mining Co. is developing the West Tree Mine, near Sudbury.

TRADE OF CANADA WITH UNITED KINGDOM INCREASING

Canadian trade with the United Kingdom increased considerably during the twelve months ending August, 1923. Imports from the United Kingdom amounted in value for the period, $153,596,630 as compared with $124,059,190 for the similar period ending August, 1922. Exports increased from $313,223,159 for the 1922 period to $381,162,654 for the similar 1923 period.

The largest item in the imports was $73,774,294 for textiles as compared with $50,061,893 for the 1922 period. It is to this increased imports of textiles that the woollen manufacturers of Canada are raising such serious objection. The Canadian Woollen Manufacturers' Association have pointed out to the Canadian Government that the present preference given to British woollens in the tariff is causing imports of these goods to steadily increase to the detriment of Canadian mills, many of which have been forced to run on part time only while several have closed down entirely. (See report of address by president of the Association in "Canadian Colorist and Textile Processor," October, 1923). Of the $73,774,294 worth of textiles imported, more than half, $40,346,259 was for woollen goods as compared with $31,959,615 of such goods for the similar 1922 period. Canada exported to the United Kingdom during the 1923 period mentioned $1,059,897 worth of textiles as compared with $1,172,400 for the 1922 period.

CHEMICALS

Trade in chemicals with the United Kingdom increased during the period under review. Imports amounted to $3,983,449 for the 1923 period as compared with $3,433,708 for the similar 1922 period. Exports of chemical products from Canada to United Kingdom increased from $1,326,120 for the 1922 period to $2,743,462 for this year's period. Of the chemical imports the largest item was for drugs and medicines, valued at $968,079 as compared with $835,583 for the similar 1922 period. Imports of sodium compounds are valued at $300,605 for this year's period as compared with $155,695 for similar 1922 period. Paint and varnish imports increased from $538,155 for last year's period to $626,430 for similar 1923 period. Imports of dyeing and tanning materials decreased from $243,817 in 1922 period to $198,957 for this year's period. Fertilizer imports show an increase from $22,086 for last year's period to $37,091 for this year. A large increase in acid exports from Canada to United Kingdom is shown, the advance being from $63,817 for last year's period to $938,720 for the similar 1923 period.

"YEAR BOOK AND EXPORT REGISTER," 1923, FEDERATION OF BRITISH INDUSTRY

This annual register is now recognized as the standard work of reference on the industries of the United Kingdom, corresponding in scope very much to the "Canadian Trade Index," published by the Canadian Manufacturers' Association. The Register is divided into two principal sections, the first giving the products of the members of the Federation. Each item is followed by a list of firms manufacturing it. In the second section the names and addresses of the firms are given in alphabetical order together with the products of each. Every important manufacturer of the United Kingdom is a member of the Federation. It was inaugurated in 1916 and in this short interval it has enrolled no fewer than 1,900 direct members, including some 170 trade associations, and is thus in touch with at least 20,000 British manufacturers.

The Register is published for the Federation by Industrial Publicity Service, Ltd., 7 Red Lion Court, Fleet Street, London, E.C. 4.

ALUMINIUM PAINT

The Aluminum Company of America of which The Northern Aluminum Company, Ltd., Canada, is a subsidiary, has issued a very attractive little booklet of twelve pages on "Aluminum Paint," being a treatise on the subject by Junius D. Edwards, assistant director of research for the company. The purpose of the brochure is to acquaint the reader with the usefulness of aluminium paint, which has many uses which the average chemist may not be aware of. The paint is made from aluminium powder formed by stamping sheet aluminium into very thin and small flakes.

Besides being very pleasing in appearance, aluminium paint is also very useful. It is opaque to light, and hence the vehicle underneath is protected from the deteriorating action of sunlight. Its protective action is also due to its high reflectivity for light, and hence it may be employed to great advantage on such structures as oil storage tanks, gas holders, refrigerator cars, etc. Bright metallic aluminium reflects some 70% of the light and has a reflectivity of about 90% for heat rays or so-called infra-red light. A well-made aluminium paint will reflect 60 to 70% of the light and probably therefore a correspondingly higher percentage of heat energy.

One of the most widely used vehicles for paints is linseed oil, but raw linseed oil alone is generally unsatisfactory for use with aluminium powder, because the mixture is too thin in consistency. If, however, a heavy boiled linseed oil is employed, a very satisfactory paint can be prepared at very low cost. A well-known brand of heavy-bodied linseed oil can be thinned with turpentine or mineral spirits in proportion of about 40 parts of linseed oil to about 60 of turpentine and the resulting mixture will be a satisfactory vehicle for aluminium powder. If the oil does not contain drier it should be added in the amount indicated by preliminary tests. About 1.5 to 2 lbs. of powder is required for a gallon of vehicle. Its covering power is excellent—one gallon ordinarily covers 600 to 900 square feet.

The booklet points out that aluminium paint is also very economical as to cost. Supposing the mixed vehicle cost 55 cents per gallon, adding two pounds of aluminium powder at total cost of $1.10, will make 1 1/8 gallons of paint. The mixed aluminium paint should, therefore, cost about $1.45 per gallon. Where the painted surface is subject to abrasion, weather or washing, a harder surface is needed, and this may be obtained by using varnish as a vehicle, adding per gallon, about the same quantity of aluminium powder as with the linseed oil.

Special properties and uses of the paint are described in the booklet, sufficient to indicate the versatility of aluminium powder as a pigment. Copies may be obtained by addressing the company at 2400, Oliver Bldg., Pittsburg, Pa.

EXPORTS OF CALCIUM CARBIDE

According to a report issued by the Dominion Bureau of Statistics, Ottawa, 12,148 cwt of calcium carbide, valued at $45,565 were exported from Canada during the month of September, 1923, compared with 81,586 cwt, valued at $326,166 exported in September, 1922. Exports for August, 1923, were considerably advanced over those for September, being 16,651 cwt, valued at $59,670. For the 12 months ending September, 1923, exports totalled 328,216 cwt, valued at $1,295,382, compared with 589,700 cwt, valued at $2,424,265 for the 12 months ending September, 1922.

The exports are chiefly distributed to the United States, Mexico, British South Africa, New Zealand, Chile and Cuba.

LEATHER FOOTWEAR EXPORTS INCREASE

Exports of Canadian-made leather footwear amounted to 14,354 pairs, valued at $40,288 for the month of September, 1923, compared with 6,738 pairs, valued at $17,230 for September, 1922.

CHEMICAL EQUIPMENT ASSOCIATION TO HOLD EXPOSITION

The Chemical Equipment Association's annual meeting was held at the Chemists' Club, New York, September 20th at 2.30 p.m., president Schenck in the chair.

The work of the Association in the ten months since it began active operations with a central executive office and a secretary was reviewed by president Schenck. Recommendations for the broadening of this work along lines of general service, advertising to equipment using fields and interchange of information among members were made.

The Association hy unanimous vote of the members present instructed the new president to appoint a committee to formulate plans for an exposition of chemical equipment. This action followed a general discussion of the relation of expositions in general to the chemical industries in their present stage of development.

It was very plainly the sense of the Association that, valuable although the presentation to the general public or to selected sections of it of the development of chemical manufactures may be, the interests of producers of equipment and supplies for the chemical industries and current conditions inherent in those industries, point to the advisability of a selling exposition also. Officers and directors for the ensuing year were elected as follows: President, T. C. Oliver, Chemical Construction Company; Vice-Presidents: E. E. Finch, Karl Kiefer Machine Company; J. George Lehman, Bethlehem Foundry & Machine Company; Peirce D. Schenck, The Duriron Company; Treasurer, P. S. Barnes, The Pfaudler Company; Directors: Harlowe Hardinge, Hardinge Company; P. B. Sadtler, Swenson Evaporator Company, H. N. Spicer, The Dorr Company; R. Gordon Walker, Oliver Continuous Filter Company; G. O. Carter, Union Carbide Company. For the sixth place on the Board of Directors Messrs. Robert McKay, International Nickel Company and L. S. Thurston, General Electric Company, received an equal number of votes. One of these two will be elected to the Board by the balance of the directors.

President Oliver has announced the appointment of a committee to formulate plans for an exposition as follows: Edwin C. Alford, T. Shriver & Company, chairman; Peirce D. Schenck, The Duriron Company; E. E. Finch, The Karl Kiefer Machine Company. The committee has been in session and has made considerable progress, it has been announced, in establishing general principles upon which definite plans will be based for presentation to the Association.

The new board of directors of the Association has been in session also and it is announced that every confidence exists that the activities of the Association will both widen and become more intensive within the next year.

J. T. Donald & Co., Limited, Montreal, has been awarded the order for the inspection required on the new Hollinger Company's Power Development.

FREE STATE INCLUDED IN PREFERENCE

An Order-in-Council, Ottawa, has added the Irish Free State to the list of British countries entitled to the British Preferential Tariff in Canada, effective on and after October 1st, 1923.

UNITED STATES MUST IMPORT 20,000,000 BUSHELS OF FLAXSEED

In 1922 the United States had an estimated flaxseed crop of 11,700,000 bushels less than one-third of its domestic requirements. The United States Department of Agriculture estimates the 1923 production at 19,400,000 bushels, less than 50% of the estimated domestic requirements. This means, states the Department, that at least 20,000,000 bushels of flaxseed, or its oil equivalent must be imported from abroad.

BRITISH COLUMBIA INDUSTRIAL NEWS

India Rubber from Fish Oil

The second axiom of P. T. Barnum's celebrated pronouncement, "You can fool some of the people all the time," is made evident by the case against Morton Gregory, just concluded in the Supreme Court of British Columbia. Mr. Gregory formed a company to take over and utilize his patents for the manufacture of India rubber from fish oil and sulphur by an electrolytic process. The Company paid him $100,000 in cash and $620,000 in stock for the patents and erected and equipped a plant at Coquitlam, but, it is needless to say, did not succeed in producing rubber. The stock was subscribed for widely throughout the Province. In a fifteen-page judgment, Justice Murphy finds that Gregory misrepresented his ability to manufacture the rubber substitute, and that the Gregory Tire & Rubber Company is, consequently, entitled to a recission of its agreement. He, therefore, ordered Gregory to refund the cash and stock paid to him for his patents. For the sake of the shareholders it is to be hoped that Mr. Gregory is able to do so.

Large Cement Mill for British Columbia

The Mainland Portland Cement Company has broken ground for the construction of a half-million-dollar cement plant at Popcum, some seventy miles east of Vancouver. The company has purchased the Hart and Damask property, which, it is said, contains an extensive deposit of high-grade marl, suited for the manufacture of cement. English capital is backing the enterprise.

The Canada Western Woollen Company, which has been taken over by the British Columbia Department of Industries, for money advanced, is to be re-sold and put into operation again, according to an announcement given out by the department.

Brigadier-General, the Hon. Ferdinand Charles Stanley, C.M.G., D.S.O., chairman of the Associated Portland Cement Association of Great Britain, was in British Columbia recently inspecting the cement plant at Bamberton, near Victoria.

NEW SEWAGE DRUM SCREEN

The Link-Belt Company has just issued a bulletin (No. 542) that will be of interest to every consulting and sanitary engineer. This bulletin describes and illustrates the Tark Screen, a new type of drum screen for the clarification of municipal and industrial sewage. The Tark Screen is the invention of a Link-Belt sanitary engineer who prior to designing this improved type of sewage screen made a careful study of the most approved practises of sewage disposal in the leading plants of Europe as well as in the principal cities of the United States.

The short-comings of existing screens for the fine screening of sewage were carefully noted, and it is claimed that the Tark Screen marks a distinct advance in the art of sewage clarification, not only from the standpoint of effective screening, but also as regards freedom from trouble and repair.

Eight of these screens, with a combined capacity of 317 million gallons daily, have been purchased by the Sewage Commission of the City of Milwaukee, on the recommendation of T. Chalkley Hatton, chief engineer, and will be installed in the fine screen house, of the new sewage disposal plant now being constructed in that city—the largest activated sludge plant in the world.

A copy of the illustrated bulletin describing the Tark Sewage Screen can be obtained by addressing the Toronto or Montreal office of Link-Belt, Limited.

LARGE INCREASE IN ASBESTOS EXPORTS

The value of Canadian asbestos exports for the 12 months ended August, 1923, exceeded the value of those of the previous year by nearly $3,000,000. These exports for the last year amounted to 202,646 tons, valued at $8,375,249, compared with 122,785 tons, valued at $5,604,551 in 1922.

IN THE PULP AND PAPER INDUSTRY

It is officially announced that the Nipigon pulp mill which is being taken over by Montreal interests after having been idle a couple of years owing to financial difficulties, will be re-opened at the first of December.

Big Development on Megiscane River

Work is being started on the Megiscane River' Que., for the immediate exploitation of the group of rapids which were recently leased by auction from the Government by a syndicate representing interests which are said to include E. W. Tobin, M.P., of the Brompton Pulp Co. Not only will the waterpower available be immediately harnessed, but the construction of a pulp mill at a cost of $1,000,000, as well as a newsprint mill, which will mean additional expenditures reaching over $1,000,000, has been decided upon. The mills will be located at proximity to important timber limits in the Temiscamingue and are expected to be in operation at the end of next year.

New Company to Complete Clarke Bros. Mill

First mortgage bondholders of Clarke Bros., Ltd., now in liquidation, met in Toronto on October 26th and voted to accept an offer of purchase of the company's properties submitted by a group of Chicago and Milwaukee business men closely associated with the pulp and paper industry. The American interests will proceed at once with the organization of a new company with a Dominion charter. The new company will take over the holdings of Clarke Bros., finish the construction of the mill, provide working capital, and put the entire plant in first-class operating condition.

Bay Sulphite Co. Control Passes to Canadian Interests

It is understood that control and management of the Bay Sulphite Co., Ltd., is now entirely in Canadian hands, Sir Frederick Becker, on his recent visit to this country having relinquished his holdings of that company's common and preferred shares. This transfer of control took place shortly before the announcement in the English papers that a receiver had been appointed for Becker & Co., Ltd., of London, England. It is not anticipated that the transfer of control to Canada will seriously interfere with the sale of pulp to leading paper mills in England, Scotland, Ireland and France, which paper mills entered into ten-year contracts with Bay Sulphite Co. and many of which are shareholders of the company.

Laurentide Co. Buys St. Joseph Limits

The Laurentide Co., Ltd., has purchased from Messrs. W. and H. Kennedy, the Lake St. Joseph limits, including saw mills, property, etc. The limits consist of about 350 square miles, comprising almost all the land surrounding Lake St. Joseph, which has not already been sold bor summer residences.

New Grinders por Belgo-Canadian Mill

Two new grinders have been installed at the Belgo-Canadian Paper Co.'s mill at Shawinigan Falls, P.Q., to supply the groundwood required by the two new newsprint machines, one of which has been running for some time and the other of which is expected to start up towards the end of November. A spur track to bring in logs by rail has also just been completed. It runs out over the river where the logs are dumped into the water and carried up the usual system of conveyors to the woodroom of the mill. Hubert Biermans, president and general manager of the company, has recently returned from the continent.

To Re-establish Dryden Paper Co.

F. Perry, of Montreal, representing the bondholders and F. A. Sabbaton, of Grand' Mere, one of the directors and a large shareholder, have been appointed receivers for the Dryden Paper Co. The action comes as a result of the company having found itself unable to pay the sinking fund and interest on its bonds, due October 1st, and at the same time finance the year's wood operations. It is understood that the application for the receivership was made with the co-operation of the directors and that it will be in the nature of a friendly receivership for the purpose of enabling the company to finance its woods operations this year and to conserve the equities of the creditors and shareholders. It is understood that no re-organization is in prospect at this time, as it is hoped that the company be placed on a profitable basis and eventually be discharged from receivership.

Courses Arranged por Paper-Making School

Arrangements have been completed for the courses to be given at the new Pulp and Paper-Making School in Three Rivers. This result was achieved at a conference between Gustave C. Piché, director of the Forestry Service of the Province of Quebec, Paul Emile Piché, director of the Pulp and Paper School, and Messrs. Carruthers (Toronto), E. Beck, Secretary of the Canadian Pulp and Paper Association; J. N. Stephenson, editor of the "Pulp and Paper Magazine"; Mr. Dalton, representing the International Paper Co., Three Rivers, and Professor Keay of the Laurentide Co. The object was to arrange two systems of courses to be given in the new school, and the co-operation of the advisors named by the Pulp and Paper Association had been sought in this respect. The first series of courses will last four years during which the students will attend the school for a period of thirty-six weeks per year, and work in the mills eight hours per day from September to June. A fifth year will comprise special courses in pulp and paper manufacture. The second section of the course comprises studies of general mechanical principles as taught in the technical schools. Evening courses will also be conducted for the benefit of the men in the mills.

Canada's Newsprint Production Steadily Increasing

The Canadian production of newsprint is continually increasing, as are its exports; and the proportion of these exports going to the United States is also on the increase. During the first six months of 1923 Canada exported 551,395 tons of newsprint, of which the United States took 536,817 tons, or 97.5 per cent.

Cznadian newsprint exports for August were 2,091,352 cwt. valued at $7,936,505. The figures for September were 1,818,591 cwt. and $6,870,190.

The total exports of pulp and paper for August and September were valued at $13,295,269 and $11,715,869, respectively.

The Canadian production of newsprint in September was 102,486 tons, as compared with 114,721 tons in August. The decline was due entirely to the smaller number of working days in September, as the actual production per day was the same in both months.

EXPORTS OF SUGAR DECLINE

Exports of refined sugar from Canadian refineries for the month of September, 1923, amounted to 328,558 lbs. valued at $27,198, of which 99,278 lbs., valued at $9,182 went to Newfoundland, 38,509 lbs., valued at $2,683 to Jamaica, 65,386 lbs., valued at $4,678 to British Guiana, 30,593 lbs., valued at $2,931 to Trinidad and Tobago, 28,609 lbs., valued at $2,785 to Bermuda, 18,900 lbs., valued at $1,489 to Miquilon and St. Pierre, and the balance to other parts of the British West Indies.

Sugar is one of the few Canadian products showing a decline in exports, a condition due to the present state of the sugar market. As compared with the above total for September, 1923, exports for September, 1922, amounted to 27,765,744 lbs., valued at $2,009,250.

LARGE INCREASE IN EXPORTS OF GOLD AND SILVER

The rapid development of Canada's mining industry, is reflected in the increase shown in exports of gold and silver. During the 12 months ending September, 1923, exports from Canada of gold-bearing quartz and bullion amounted in value to $10,443,618 as compared with $3,542,908 for the corresponding period a year ago.

Exports of silver, contained in ore, concentrates, etc. for this year's period amounted to 6,412,510 ounces, valued at $4,147,165 compared with 4,963,549 ounces, valued at $3,289,974 for the corresponding 1922 period.

Exports of silver bullion for this year's period amounted to 12,594,714 ounces, valued at $8,275,-700 compared with 9,931,052 ounces, valued at $6,786,189.

It is interesting to note the destination of the silver bullion and the following shows the exports of bullion for the month of September, 1923.

	September, 1923 Quantity oz.	Value $
Silver Bullion—		
To United Kingdom	371,949	235,021
To United States	436,973	278,526
Hong Kong	75,963	48,379
China	50,792	32,348
Japan	3,556	1,903
Total	939,233	596,177

COURTAULDS, LTD. TO BUILD NEAR CORNWALL

Messrs. Courtaulds, Ltd., of London, England, the largest manufacturers of artificial silk in the world, have purchased from the Sun Life Assurance Co. of Canada the farm known as "French Farm," comprising 240 acres, on the banks of the St. Lawrence River at Cornwall, for the purpose of erecting a manufacturing plant to take care of the Canadian end of their business. About 500 persons will be employed, half male and half female. Car tracks are now being laid to the site that building operations may be commenced as early in the new year as conditions will allow.

Heavy iron ore shipments, viz., 9,480,891 tons, as against 6,658,148 tons last year, accounted for practically all of the 1,788,824 tons increase in traffic through the Canadian and American locks of the Sault Ste. Marie canals.

RUHR SITUATION SERIOUSLY EFFECTS IRON MINING IN NEWFOUNDLAND

Conditions in the occupied German territory are being felt in the Newfoundland iron mines. The shipments of ore from Bell Island to Germany in 1922 totalled 750,000 tons, while this year the total will not reach 200,000 tons. An effort is being made to make up this deficit by placing ore in the United States and in Great Britain, but only a foothold was obtained in these markets. The quantity shipped to these places would not provide more than a month's employment at Bell Island. The British Empire Steel Corporation acknowledges a certain obligation to the workmen who established houses at Bell Island and who look solely to mining for a living, and to minimize the effect to these, it was decided to keep two mines operating, thus keeping about 1,100 men engaged to the end of the season. This program was made possible by increasing ore shipments to Sydney, quite a quantity of which will still be on hand next season.

Demand for finished iron and steel is showing steady improvement in the domestic and export market. The Steel Co. of Canada and the British Empire Steel Corporation have recently closed extensive orders for bars for shipment to Japan.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Bleaching Pulp—L. Bradley and E. P. McKeefe, 234710, October 9th, 1923. The pulp is showered or sprayed in finely divided state into an atmosphere of Cl gas and any excess Cl is removed from the pulp by vacuo. Apparatus is also specified.

Treatment of Coal—F. G. Price, 234652, Oct. 2nd, 1923. Finely divided coal is made into a pulp with water and subjected to a flotation treatment in the presence of a protective colloid such as starch which inhibits the flotation of fusion.

Rotary Furnaces for Liquid Fuel—F. M. Allen, 234648, October 2nd, 1923.

Apparatus for the Production of Sodium Sulphate—N. A. Laury, 234603, October 2nd, 1923.

Low Carbon Nickel Chrome Steel—A. H. Coplan, 234576, October 2nd, 1923. Steel scrap of low C. content is heated to 3500° F., the C. is removed with an oxidizing slag, the Si is removed, the S & P reduced to 0.03% and the slag is removed. 2% of a Fe. Cr. alloy having 7% C is added to the steel after the alloy has been heated with equal portions of Fe ore at 2500°F. to reduce the C to 3%, 2% Ni is added and the O and other gases are removed before pouring by using as a scavenger 1.5% FeSi and 5% of a compound containing 50% Al and 50% Fe-Ti. The mixture in the form of an ingot is plunged into the steel at 3500°F.

Method of Suspending Electrodes—C. W Soderberg, 234982, October 16th, 1923. An electrode being baked in the furnace in which it is used, is suspended by attaching a holder to the lower baked port of the electrode. The holder may be moved upwards as the electrode burns away. The electrode may be hollow and the holder may be placed in the cavity or surround the electrode.

Electrodes—R. H. McKee, 234941, October 16th, 1923. An electrode for electrolytic purposes has a conductive base and a pervious, adherent, acid-resisting coating. The coating may comprise infusorial earth and a silicious bonding material.

Storage Batteries—J. F. McCauley, 234938, October 16th, 1923. A battery contains positive and negative concentric electrodes spaced apart, each having longitudinal corrugations.

Homogeneous Crystalline Products—H. A. Richmond and R. MacDonald, 234502, September 25th, 1923. A refractory, insulating and abrasive product characterized by great hardness, solidity, resistance to fracture and fine crystn. is composed of oxides of B., Al, Si, Fe and Ti fused together.

Furnaces for Melting and Casting—G. H Benjamin, 234490, September 25th, 1923.

Apparatus for the Electrolysis of Water—L. Casale, 234489, September 25th, 1923. The electrode of the apparatus consists of superposed elements connected together in the manner of a louver, each element consisting of a truncated pyramidal box open at the top and bottom and of rectangular section. Partitions depend from the cover of the apparatus and extend under the liquid to form a closed cell for the liberated gas.

The Fixation of Nitrogen—P. Andreu and R. Paquet, 234557, October 2nd, 1923. A mixture containing Ti is heated to 1850° in an atmosphere of N. Charcoal and a salt of an alkaline earth metal may he added to the mixture. The nitrides and carbides formed are subjected to the action of steam to produce NH_3, HCN, etc.

Phenolic Condensation Product—C. B. Carter and A. E. Coe, 234506, September 25th, 1923. A reaction is caused between an aldehyde dichloride, a phenolic body and NH_3, sufficient NH_3 being used to combine with substantially all the Cl of the dichloride, the NH_4Cl is separated from the resin formed and the NH_3 recovered for further use.

Gas Analyzing Apparatus—R. E. Cooper and C. O. Sisler, 234895, October 16th, 1923. The apparatus consists of an aspirator connected with pipes for supplying gas and water at a constant rate and for discharging into an electrolytic cell and with means for continuously determining the conductivity of the liquid in in the cell.

Apparatus por Mixing Liquids and Gases in Water Purification—Wm. Paterson, 234890, October 9th, 1923.

Production of Anhydrous Magnesium Chloride—H. Bull,, 234834, October 9th, 1923. MgO and a carbonaceous material are reacted upon with Cl gas at a temperature below the fusion point of $MgCl_2$.

Soldering Flux—H. A. Palladay, 234790, Oct. 9th, 1923. A soldering flux contains $ZnCl_2$ 44.44, Sn 33.33 NH_4Cl 21.90 and glycerine 0.33%.

Storage Battery Insulator—F. J. Erickson, 234739, October 9th, 1923. An insulator for battery plates comrpises a sleeve of flexible insulating material, having its top and bottom open and cut away at each side leaving only a narrow strip adapted to surround the plate adjacent to its edges.

Recovering Zinc prom Complex Ores—J. T. Ellsworth, 234918, October 16th, 1923. The material is treated with a cyclic solvent solution and prior to electrode-position the solution is concentrated to remove an amount of soluble salts so that when the concentrated solution is diluted for electrolysis the concentration of the soluble salts will be insufficient to produce supersaturation of the solution at any subsequent stage in its cycle.

Arsenical Compounds—K. B. Edwards, 234917, October 16th, 1923. Arsenical compounds of the general formula R_3AsS_4 where R is an alkaline metal or NH_4 are prepared by treating AsS_3 with a solution of an alkaline polysulfide and reducing the salts to anhydrous form.

Diamino-Dioxyarsenobenzene-Silver Oxide Compounds—A. E. Sherndal, 235166, October 23rd, 1923. Freshly prepared silver oxide, free from toxic inorganic salts, is dissolved in an alkaline solution of diamino-dioxy arsenobenzene. The Ag-As product is a brown amorphous powder readily soluble in water with alkaline reaction and is suitable for intravenous injection.

Recovering Oxalic Acid—E. A. Barnes, 235148 October 23rd, 1923. The residual liquors from the manufacture of $Hg(CNO)_2$ are subjected to evaporation and oxidation of the glycolic acid to oxalic acid which crystallizes out.

Speeding and Aiding the Absorption or Evolution op Gases—H. B. Kipper, 235103, October 23rd, 1923. The reaction between gases and reactive substances is assisted by subjecting the substances in the presence of the gas to a grinding and mixing action, e.g. NiCN, compounds are produced by subjecting Na_2CO_3, C and Fe in the presence of N at 500-1200° to grinding and mixing actions by the action of blows of rapidly rotating hammers. The product may then be similarly treated with steam at 250-700° to produce NH_3.

Calcium Arsenate—H. Howard and E. A. Taylor, 234984, October 16, 1923. A mixture of slaked lime and As_2O_3 is calcined in the presence of air. Quicklime and white As may be mixed in the proportion of CaO 55 and As_2O_3 45 parts by weight, the mixture slaked and heated to about 700° in a strongly oxidizing atmosphere.

CANADA'S COPPER PRODUCTION

The production of copper in Canada during 1922 was 42,879,818 pounds, the lowest year's output since 1904. At the average price in New York over twelve months this was worth $5,738,177 as against 47,620,820 pounds and $5,953,555 for 1921. The total production of refined copper during the last year was 730,000 pounds as compared with 4,286,000 pounds in 1921. During 1922 the plants of the British American Nickel Corporation were idle and the total Canadian production was from the refinery at Trail.

Production of nickel in Canada during 1922, the lowest recorded for any year since 1904, was 17,597,123 pounds, valued at $6,158,993.

BRITISH CHAMBERS OF COMMERCE FAVOR A STANDARD GALLON MEASURE

At a recent meeting of the Association of British Chambers of Commerce, Mr. A. Barton Kent, in proposing the resolution given below, gave several instances of the confusion which arises in overseas trade by the difference between the Imperial and the American gallon. While neither country would be likely to propose that the other should adopt their gallon, it might be possible to combine and start a new gallon of four litres, which would be a little smaller than the Imperial and a little larger than the American gallon. The resolution, which was seconded by Mr. Parsons (Southampton), was carried, and read as follows:

"That in order to obviate difficulties which now arise from the difference between the Imperial and American gallon, and also to promote uniformity of practice throughout the world, this association is of opinion that it is desireabl that all trades, especially those engaged in overseas trade, should employ some universally accepted measure such as the litre, the use of which is already permitted by law, as the sold unit of capacity, and expresses satisfaction that the Home Affairs and Transport Committee of the Association have undertaken an enquiry into the question."

The Goldie & McCulloch Co., Ltd., Galt., Ont., the Babcock & Wilcox Co., of New York, and Babcock & Wilcox, Ltd., of London, Eng. have organized a new Canadian Company, to be known as Babcock-Wilcox & Goldie-McCulloch, Ltd., with a capitalization of three million dollars.

Work at the Des Quinze Rapids, where the Des Quinze Power Co. is erecting an immense dam to exploit the water power, is progressing very rapidly. Some 500 men are now engaged in various works in that section and the transmission lines are being installed to the Ontario mining district.

NEW MINING COMPANIES

The Dubuisson Gold Mining Co., Ltd., with a capital of $3,500,000 and head office in the town of Amos, in the district of Abitibi, has recently been incorporated by Ontario interests. The capital of the company is divided into three million five hundred thousand shares of the par value of $1 each.

Another mining company, to be known as the Don Rouyn Gold Mines, Ltd., to operate in the new Rouyn gold fields has also been recently incorporated, with a capital of $2,000,000 and head office in Montreal. The stock is to be divided into two million $1 shares.

GOOD POSSIBILITIES AT NORANDA MINE

The find of The Noranda Mines, Ltd. near Osisko Lake, Rouyn Township, Que., is proving one of the finest known in the Northern mining world. The width on the surface is over 100 feet, and a length of 700 feet is indicated. An average assay of the proved area is over $5 gold per ton. The best section is a nineteen-foot width averaging $26 gold per ton.

MANY CLAIMS STAKED IN NEW IRON AREA

More than two hundred claims have been staked in the new iron area near mile post 60 in the Algoma Central Railway, Ontario. Dr. Millar, Ontario Provincial Geologist, visited the area towards the end of October and reported that while much claiming was being done, no drilling had been carried out as yet, and that therefore he could not give any statement as to the possibilities of the area.

IMPORTS OF NARCOTIC DRUGS

A recent report of the Dominion Bureau of Statistics shows the following imports into Canada of Narcotic Drugs, during month of September, 1923.

Cocaine, 104 ounces, valued at $471, as compared with 451 ounces, valued at $2,360 for September, 1922. Codeine and Salts of, $1,671, as compared with $726 for September, 1922. Morphine, 498 ounces, valued at $1,102, as compared with 300 ounces, valued at $491 for September, 1922. Opium, crude, 50 lbs., valued at $242, compared with 25 lbs., valued at $76 for September, 1922. Imports of powdered opium for the 12 months ending September, 1923, amounted to 314 lbs., valued at $1,072. All imports of narcotics were from United Kingdom ports.

PERSONAL

Mr. D. A. Campbell, formerly president of the Campbell Flour Mills Co., Toronto, has been appointed general manager of the Maple Leaf Milling Co., Toronto.

NEW INSPECTOR FOR ASBESTOS MINES

Mr. Eugene Larochelle, a graduate of the Ecole Polytechnique of Montreal, who has made special studies of asbestos, has been appointed engineer of the Quebec provincial mine bureau by Hon. J. E. Perrault, head of that department. The new official will act as assistant to Mr. A. O. Dufresne, chief engineer of that branch, and will be especially assigned to the inspection of asbestos mines in the province.

LARGE ORDER FOR ELECTRICAL EQUIPMENT

Two contracts for electrical equipment, amounting to more than $1,000,000 have been awarded to the General Electric Co. One order was from the Southern Canada Power Co. for a 65,000 kilowatt generator, with the necessary transformer capacity, at a price in excess of $500,000. The second order calls for the delivery of a 160,000 kilowatt generator with transformer capacity for the Newfoundland Power and Paper Co. All of the switching equipment, according to the plan adopted in England, will be made by the British Thompson-Houston Electric Co., there, while the generating apparatus and transformers will be manufactured in Canada. Deliveries will be completed by May, 1924.

ASBESTOS PRODUCTION

The total quantity of asbestos mined in Canada during 1922, amounted to 2,562,933 tons. The sales for the year were 163,706 tons, valued at $5,552,723. The entire production was derived from Eastern Quebec.

MEAT PACKERS APPOINT DIRECTOR OF RESEARCH

Dr. W. Lee Lewis, head of the department of chemistry of Northwestern University, has been appointed director of scientific research for the Institute of American Meat Packers with headquarters in Chicago. The purpose of this division of the Institute's activities is to make a study of the research problems presented by the packing industry. The trustees of Northwestern University have granted Dr. Lewis a leave of absence from February 1st, 1924, for the period of one year, in order to allow him to devote his time to the organization of this work. This arrangement includes the continuation of the direction of research work under Dr. Lewis on carbohydrates and organic arsenic compounds now being carried on at Northwestern. During Dr. Lewis' absence, Prof. Frank C. Whitmore will serve as acting chairman of the department.

LARGE INCREASE IN COAL PRODUCTION

The largest day's output in the past nine years was obtained at the collieries of the Dominion Coal Co., Sydney, on September 25th, when 17,074 tons were raised, and at some of the mines the biggest output in recent years was produced.

The total production for the first nine months of 1923 was 2,527,000 tons as compared with 1,867,000 for the same period in 1922; and the 1923 shipments were 2,340,000 tons against 1,665,000 tons in 1922.

LINK-BELT ACQUIRES MEESE & GOTTFRIED CO.

Charles Piez, president of the Link-Belt Company, Chicago, announces the purchase of the Meese & Gottfried Co., of San Francisco, Los Angeles, Seattle and Portland.

For the past ten years Link-Belt Company has been distributing its products on the west coast through its subsidiaries, the Link-Belt Northwest Company, of Seattle, and the Link-Belt Pacific Company, of San Francisco. The improvement in distributing facilities effected by the consolidation, and the additional manufacturing facilities acquired, should give the rapidly-growing industries of the Pacific coast highly economical and efficient service.

Meese & Gottfried Co., and its predecessors, have been manufacturers of power transmission machinery and distributors of conveying and transmission machinery on the coast for more than forty years, and were well and favorably known from the Canadian to the Mexican border. The new organization will be known as Link-Belt Meese & Gottfried Co., with headquarters at San Francisco.

COMPANY NEWS

Incorporation has been granted to the Wheeler Tire and Rubber Goods Co., Toronto.

The annual sales of the Ford Co. of Canada, for the year ended July 31st, 1923, amounted to $38,556,182.80, an increase of $9,282,928.71 over the previous year.

The control of the Canadian General Electric Company has been assumed by the General Electric Company, of New York. The present capital of the Canadian Company is $12,800,000. The personnel of the staff, management and directorate will remain unchanged.

The profits of the Goodyear Tire & Rubber Company for the year ending September 30th, 1923, amounted to more than a million and a half dollars.

CANADIAN LEAD PRODUCTION

The production of lead in Canada, during 1922, amounted to 93,307,171 lbs., valued at $5,817,702, compared with 66,679,592 lbs., valued at $3,828,742 in 1921. British Columbia alone produced 87,093,266 lbs.

F. S. ANSON, DEAD

Mr. F. S. Anson, President of the Abitibi Power Co., died suddenly in Montreal, on November 1st, following an operation. Mr. Anson, who was formerly connected with the Ogilvie Company, was one of the best known figures in the Canadian pulp industry.

CONSTRUCTION OF STEEL PLANT COMMENCED

The Dominion Alloy Steel Company, who recently acquired 250 acres on the St. Clair River, near Sarnia, have commenced the construction of their plant for the manufacture of alloy, high carbon and special quality steel.

PERSONAL

Mr. H. N. Stephens, Ph.D., A.C.I.C., formerly on the staff of Wesleyan College, Montreal, is now on the staff of the Department of Chemistry of the University of Minnesota, Minneapolis. Mr. Stephens obtained the degree of Ph.D. from McGill University last spring.

Chemical, Oil and Metal Markets

CHEMICALS

Each week since the beginning of October has seen a steady increase in the volume of trade in chemicals. Canadian producers and distributors alike are of the opinion that the coming winter will prove quite active in all lines of chemicals. One firm who do a large business in general chemicals report that October was the best month they had experienced for over a year. The fact is that, for the most part, consumers are short stocked, the result of too long waiting for quotations to drop further, and while there is still keen competition, the era of price-cutting has practically ceased. Compared with the declines that occurred almost weekly in many lines for the past six months, October business showed beyond any doubt that prices had stabilized to a remarkable degree. Of course, there is still evidence on the part of some to get orders at any price, but such offerings are confined to a very few lines and represent only a very small fraction of total business.

During the last week of October, American producers of bleaching powder dropped car lot prices from $1.75 per cwt. to $1.25 per cwt., for standard drums in car loads, due to over-production. Such action has developed a "Bleach war" in American markets and consumers there are getting cheap bleach. One large alkali company is offering 1924 contracts on bleach at $1.50. But the point is that Canadian producers have not found it necessary to even shade their prices on bleach in the face of such a large drop on the "other side." That some Canadian consumers have placed car lot orders at $1.25 per cwt., f.o.b. American mills, has not altered Canadian prices which are still $2.50 to $3.00 per cwt. for drum lots, and none is being shipped at less than $2.25 in car lots. The chief reason for this "standing pat" is that liquid chlorine is largely replacing bleaching powder in Canada and Canadian producers have succeeded in building up a very good trade in liquid chlorine at eight to nine cents per lb. in cylinders of 150 lbs. The situation is somewhat serious for American producers however, for it is evident that makers are taking severe losses when bleach is selling as low as $20 per ton, f.o.b. works.

Arsenic which has been active on the market for some months has again advanced one cent per lb., due to increased demand.

Copper sulphate is quoted half cent per lb. lower, due to the weak condition of the metal. Demand is improving for potassium chlorate and considerable business has been done in both powdered and crystal at ten to eleven cents per lb.

All the acids are remaining steady and no variations from October 1st quotations are noticed with the exception of gallic acid, which is offered at twenty-five cents per lb. less.

Improvement is shown in nearly all the consuming industries except leather. The tanneries, due to falling off in their trade, are buying only in small lots. The steel mills continue to purchase in increasing quantity and business is likewise improving with the rubber, paint and varnish, soap, and textile plants.

Coal Tar Products

The coal tar market has been rather dull of late and prices are for the most part easier, except in certain of the refined products such as pyridine which is scarce and very firm at $4.50 to $5.00 per gal. f.o.b. New York. Benzol is fairly active at 50c. per gal. for the 100% and 45c. for the 90%. Crude coal tar in bbls. is offered at $8.75 per bbl., Toronto, and the refined at $9.25, a decrease of $1.50 per bbl. from the quotations which prevailed during the past summer.

Metals

The feature of the metal market is the continued strength shown by zinc, an advance of $1.00 per ton taking place during the last week of October. Producers are confident that demand will keep up on zinc and as a result prices are firm at all points, though actual buying cannot be said to have greatly increased. Quotations on lead have declined 10c. per cwt. from October 1st prices, due to some falling off in demand from the large tonnage users, such as the lead cable makers. Copper continues dull, although a slight recovery was noticed at the opening of November, when an advance of 1/8c. per lb. occurred.

Although makers of iron goods are busy, yet on account of the large stocks of raw material they are carrying, there has been little demand for pig iron, and as a result, quotations on the latter have declined from $31.80 per ton to $29.30. Trade in galvanized sheets is brisk, with some strengthening to prices.

The British Market

Conditions in the chemical trade of Great Britain have not yet improved sufficiently to restore general confidence among either buyers or sellers, and so far as domestic business is concerned this is restricted to the meeting of current requirements Export trade has been better, particularly as compared with the August figures, which were very discouraging The September returns record exports totalling £2,341,761, as compared with the 1922 figure of £1,733,883, but in August there was a decrease in exports from the 1922 total of £1,662,609 to only £1,645,856. Imports during the past month amounted to £1,023,552, as compared with £1,032,511 for September, 1922, both figures being less than the corresponding August totals amounting respectively to £1,315,825 for 1923 and £1,125,021 last year.

For the nine months ended September 30th imports aggregated £9,998,879, as against the 1922 total of £8,343,644, and exports reached £18,847,686 as compared with £15,256,693 for the corresponding period of 1922. Trade is best in the heavy section of the industry.

Prices have kept fairly firm, but there have been a few changes in a downward direction, amongst these being a reduction of half a crown per ton for bleaching powder and of £2 per ton for borax and boric acid. The price of borax now varies from £24 10s. per ton, granulated to £27 per ton for extra fine powder, carriage paid and packed in two-cwt. bags.

In regard to sulphate of ammonia, the British Federation have now fixed their prices at £14 15s. per ton for November delivery for home consumption. Prices on the Continent are quoted £14 to £15 per ton, with a quiet market ruling.

CURRENT CANADIAN MARKET QUOTATIONS ON CHEMICALS, GUMS, OILS AND METALS.

GENERAL CHEMICALS

Acetaldehyde, 99%, carlots, 20,000 lbs. and over	lb.	.15 —	
Less than carlots	lb.	.16 —	
Both quotations f.o.b. Shawinigan Falls, Que.			
Acetone, pure, drums or over	lb.	—	.34
Lesser amounts	lb.	—	.40
Acid—			
Acetic, 28%, car. lots	100 lbs.	—	5.05
28%, 25 bbl. lots	100 lbs.	—	5.30
28%, 10 bbl. lots	100 lbs.	—	5.55
28%, 5 bbl. lots	100 lbs.	—	5.80
28%, 1 or 2 bbl. lots	100 lbs.	—	6.05
80%, carload lots	100 lbs.	—	14.00
80%, 25 bbl. lots	100 lbs.	—	16.00
80%, 15 bbl. lots	100 lbs.	—	17.00
80%, 10 bbl. lots	100 lbs.	—	17.25
80%, 5 bbl. lots	100 lbs.	—	17.75
80%, 3 or 4 bbl. lots	100 lbs.	—	18.75
80%, 1 or 2 bbl. lots	100 lbs.	—	19.00
Glacial, bbls.	lb.	—	.12
Carboys	lb.	—	.12½
Boric, crystals, bbls	lb.	—	.13
Boric, powder, bbls	lb.	—	.12½
Benzoic	lb.	.85 —	.90
Butyric, 98-99% pure, f.o.b. Shawinigan Falls	lb.	1.00 —	
Citric, kegs	lb.	.50 —	.55
Formic, 75%, carboys, 100 lbs.	lb.	.20 —	.21
Gallic, tech	lb.	.50 —	.55
Gallic, B. P.	lb.	1.00 —	1.25
Hydrochloric, 18°, carboys, 100 lbs.	lb.	2.25 —	2.75
Hydrofluoric, 60%	lb.	.22 —	.25
Hydrofluoric, 30%	lb.	.11 —	.13
Lactic 44%, tech., ligbt, bbl.	lb.	—	
Lactic 22%, tech., light, bbl.	lb.	—	
Muriatic, see acid hydrochloric.			
Nitric, 36°, carboys	100 lbs.	8.25 —	9.00
Oleic	lb.	—	.26
Oxalic	lb.	.11 —	.13
Phosphoric, 85%	lb.	—	.28
Phosphoric, 50%	lb.	—	.22
Pyrogallic, resublimed	lb.	2.00 —	2.10
Salicylic, tech., bbl	lb.	.47 —	.48
Salicylic, B.P. bbl	lb.	.47 —	.50
Sulpburic, 66°, carboys	100 lbs.	2.25 —	2.75
Sulphuric, 66°, tank cars, f.o.b. works	ton	19.00 —	20.00
Stearic, double pressed	lb.	.20 —	.22
Stearic, triple pressed	lb.	.23 —	.24
Tannic, B.P	lb.	.80 —	.90
Tannic, tech	lb.	.45 —	.55
Tartaric, crystals, bbls	lb.	.35 —	.40
Tartaric, powder, bbls	lb.	.36 —	.42
Alcohol, absolute Ethyl, case of 1 doz. 1 lb. bottle		—	3.15
In steel drums of 10 gals. capacity	Imp. gal.	—	23.00
Acetone, bbls. or over	gal.	—	1.75
Lesser amounts	gal.	—	2.00
Aldehyde Ammonia	lb.	—	.75
Alum, Ammonia, lump or ground	100 lbs.	3.75 —	4.50
Aluminium Sulpbate, lump bags	100 lbs.	2.25 —	2.50
Ground, bags	100 lbs.	2.50 —	2.75
Iron, free	100 lbs.	—	4.00
Ammonia, aqua, 26°, carboys	lb.	.13 —	.14
Drums	lb.	—	.09½
Ammonium, Carbonate	lb.	.12 —	.15
Chloride	lb.	.10 —	.13
Amyl Acetate, tech	gal.	—	4.00
Pure	lb.	—	.80
Arsenic, white	lb.	.13½ —	.15
Barium, Sulphate, B.P	ton	—	60.00
Cbloride	lb.	.06 —	.08
Nitrate	lb.	—	.16
Peroxide	lb.	—	.26
Blanc fixe, dry, bbl	lb.	—	.04¾
Pulp, bbl	ton	—	
Bleaching Powd., 35%, drums	cwt.	2.50 —	3.00
Borax, crystals	lb.	.05¾ —	.06
Bromine, tech	lb.	—	.38
Benzaldehyde	lb.	1.35 —	1.60
Butylaldehyde	lb.	.60 —	
Calcium Acid, Phosphate	lb.	—	.07½
Carbide, ton lots, f.o.b. wks.	ton	—	95.00
Carbide, less than ton lots	ton	—	100.00
Chloride, fused	ton	—	35.00
Chloride, flake	ton	48.00 —	50.00
Caustic Soda, flake, drms.	100 lbs.	5.00 —	5.50
Ground, drums	100 lbs.	5.00 —	5.50
Solid, drums	larger	4.25 —	4.75
Carbon Bisulphide, drums	lb.	.10 —	.12
Tetrachloride, drums	lb.	—	.16
Cblorine, liquid, in cylinders of 150 lbs.	lb.	.08 —	.09
Cobalt Oxide, black	lb.	—	2.00
Grey	lb.	—	2.25
Copperas, crystals	lb.	.02 —	.02¼
Sugar	lb.	.02 —	.02¼
Copper Sulphate (blue vitriol)	lb.	.07 —	.07½
Corrosive Sublimate	lb.	1.00 —	1.50
Cyanide, Crude	lb.	—	.22
Dextrine, potato	lb.	—	.06
Corn	lb.	—	.08½
Ether, B.P. (conc.)	lb.	—	.55
Sulphuric	lb.	—	.25
Ferric Chloride, crystals	lb.	.08 —	.08½
Solution	lb.	—	.06
Formaldehyde, bbls. or over	lb.	—	.17
200-lb. kegs	lb.	—	.18½
100-lb. kegs	lb.	—	.19
50-lb. kegs	lb.	—	.19½
Fullers' Earth, powder	100 lbs.	2.00 —	2.50
Car lots, f.o.b. Toronto	ton	—	30.00
Fusel Oil, special, refined	gal.	4.00 —	4.50
Glycerine, crude, drums	lb.	—	.15
Crude, single tin of 56 lb.	lb.	—	.17
C.P., single tin of 56 lbs.	lb.	—	.28½
C.P., two or more tins	lb.	—	.26½
C.P. drums, 500-1,000 lbs.	lb.	—	.20½
Pale straw, drums, 500-1,000 lbs.	lb.	—	.19½
Pale straw, single tin 56 lb.	lb.	—	.27½
Pale Straw, 2 or more tins	lb.	—	.25½
Hexamethylene Tetramine	lb.	.90 —	.95
Hydrogen Peroxide	gal.	—	.75
Iron Oxide, red, casks	lb.	.13 —	.20
Lead, Acetate	lb.	.14 —	.16
Nitrate	lb.	.14 —	.15
Lime, grey	ton	—	14.30
Grey, in car lots	ton	—	11.70
Hydrated, in ton lots	ton	—	20.00
Litharge	lb.	.09 —	.10
Lithopone	lb.	.06½ —	.07
Magnesite, Calcined	ton	—	30.00
Clinkered	ton	—	35.00
Raw	ton	—	10.00
Magnesium, Carbonate, bbls.	lb.	.14 —	.16
Sulphate, B.P	cwt.	2.50 —	2.60
Tecbnical, car lots	ton	—	30.00
Methyl Hydrate (wood Alcobol), 95%, bbls. or over	gal.	—	1.10
95%, half-bbl. lots	gal.	—	1.30
95%, lesser amounts	gal.	—	1.35
97%, bbls.	gal.	—	1.10
97%, balf-bbl. lots	gal.	—	1.30
97%, lesser amounts	gal.	—	1.35
Nickel Salt, single, in bbl. lots.	lb.	—	.13½
Single, per cwt	lb.	—	.15
Double, barrel lots	lb.	—	.14
Double, per cwt	lb.	—	.15½
Phosphorus, yellow	lb.	—	.34
Potash Prussiate, yellow	lb.	.33 —	.36
Potassium, Bicarbonate	lb.	—	.19
Bichromate	lb.	.15 —	.16
Carbonate, calc. 80-85%	lb.	—	.14
Chlorate	lb.	.10 —	.11
Citrate	lb.	.80 —	.90
Hydroxide (caust. potash)sticks		—	.40
Hydroxide (caustic potash), small drums	lb.	.12 —	.14
Hydroxide (caustic potash) large drums	lb.	.10 —	.11
Nitrate, casks	lb.	.08½ —	.09
Permanganate, bulk	lb.	.19 —	.20
Red Precipitate (mercuric ox.)	lb.	—	1.75
Silver Nitrate	lb.	—	9.00
Soda Ash, bags	cwt.	2.25 —	2.40
Sodium, Acetate, ton lots or ov.	lb.	—	.06
Lesser amounts	lb.	—	.06½
Aluminium Pbospbate	lb.	—	.03½
Benzoate	lb.	—	.75
Bicarbonate, 100% pure	lb.	2.50 —	3.00
Bichromate, bbls	lb.	.10 —	.13
Bisulphite, powder	lb.	.05½ —	.06
Bisulphite, 35 Be	lb.	.03 —	.03½
Bromide (foreign)	lb.	.20 —	.22
Cyanide, bulk, 98-99%, in cases	lb.	—	.34
Fluoride, 95-98%	lb.	.15 —	.16
Hyposulphite, kegs	100 lbs.	4.75 —	5.00
Barrels	cwt.	4.00 —	4.50
Iodide	lb.	—	5.20
Nitrate, refined	cwt.	6.75 —	7.00
Crude, 95%	cwt.	5.25 —	5.75
Nitrite	lb.	.12 —	.15
Perborate, U.S.P	lb.	.35 —	.40
Peroxide, f.o.b. New York	lb.	.25 —	.27
Silicate, 42°, car lots	cwt.	—	1.35
Smaller lots	cwt.	—	1.55
Silicate, 40°, car lots	cwt.	—	1.25
smaller lots	cwt.	—	1.45
Sulphide, 60-62% fused, drums car lots	lb.	.05 —	.05½
Sulphate (Glauber's Salts), crystals, in bags	cwt.	1.80 —	2.00
Car lots	cwt.	1.65 —	1.75
Sulphite	lb.	—	.02
Prussiate, yellow	lb.	.14 —	.16
Sulphur, ground	100 lbs.	2.50 —	2.75
Roll	100 lbs.	4.25 —	4.75
Talc, No. 1 grade	ton	—	33.00
No. 2 grade	ton	—	25.00
No. 3 grade	ton	—	21.00
Tin Chloride, crystals	lb.	.30 —	.35
Tri-Sodium Phosphate	lb.	.07 —	.07½
Ultramarine, blue	lb.	.10 —	.29
White Precipitate (mercuric-Ammonium chloride)	lb.	1.90 —	2.00
Whiting (English)	ton	28.00 —	30.00
(American)	ton	22.00 —	25.00
Zinc, Sulphate, com	lb.	.05 —	.05½
Dust	lb.	.13 —	.14½
Oxide, lead free	lb.	.10 —	.11
Stearerate	lb.	.30 —	.35

PHARMACEUTICAL CHEMICALS

Ammonia, Aqua, C.P	lb.	—	.22
Iodide	lb.	—	6.25
Aspirin, 100 lb. lots, bulk	lb.	—	.95
Caffeine, Englisb	lb.	—	3.50
Calomel (mercurous chloride	lb.	1.30 —	1.50
Camphor, Monobromate	lb.	—	2.60
Refined, slabs	lb.	—	1.30
Refined, Tab	lb.	—	1.40
Carbolic Acid, white crystals	lb.	.40 —	.45
Chloroform	lb.	.40 —	.50
Coumarin	lb.	3.75 —	4.00
Cream Tartar, 98%	lb.	.25 —	.30

Ether, B.P	lb.		— .55
Iodine, crude	lb.	4.50	— 4.75
Resublimed	lb.	5.50	— 5.60
Lithium Carbonate	lb.	1.80	— 2.10
Potassium Bromide, crystals	lb.	.18	— .20
Granular	lb.	.18	— .20
Iodide	lb.		— 4.50
Phenacetin	lb.	1.75	— 2.00
Phenolphthalein	lb.		— 1.75
Quinine	oz.	.55	— .60
Saccharin	lb.		— 1.50

SYNTHETICS

Benzyl, Acetate	lb.		— 1.75
Benzoate	lb.		— 1.75
Citral	lb.		— 4.50
Coumarine	lb.		— 3.75
Heliotropine	lb.		— 3.00
Linalyl Acetate	lb.		—13.50
Methyl Salicylate	lb.		— .50
Musk, Xylol	lb.		— 3.00
Teyseniol	lb.		— 1.00

ESSENTIAL OILS

Anise	lb.		— .80
Bay	lb.		— 3.00
Bergamot	lb.		— 4.50
Cajaput	lb.		— 1.25
Camphor, white	lb.		— .50
Brown	lb.		— .25
Cassia	lb.		— 2.00
Cedar Leaf	lb.	1.90	— 2.00
Cedar Wood	lb.		— .50
Citronella, Ceylon	lb.		— .60
Java	lb.		— .85
Clove	lh.		— 2.25
Eucalyptus	lb.		— .65
Geranium Bourbon	lb.		— 7.50
Lavender	lb.		— 5.00
Spike	lb.		— 1.25
Lemon	lb.		— .75
Lemongrass	lb.		— 1.35
Lime, distilled	lb.		— 1.00
Orange Sweet, Sicilian	lb.		— 3.50
West Indian	lh.		— 3.00
Peppermint, American	lb.		— 3.50
Japanese	lb.	2.50	— 2.75
Redistilled, B.P	lb.	4.00	— 4.25
Patchouli	lb.		—10.00
Otto of Rose	oz.		— 6.50
Rosemary	lb.		— .65
Sandalwood	lb.		— 7.50
Sassafras	lb.		— 1.75
Thyme	lb.		— 1.45

VEGETABLE OILS

Castor Oil, No. 3, bbl	lb.	.16½	— .17½
No. 1, bbl	lb.	.18	—
Chinawood Oil	lb.		— .27
Cocoanut, Ceylon, bbl	lb.		— .11
Cochin, bbl	lh.		— .12½
Corn Oil, bbls	lb.		— .12
Tank cars	lb.	.09¾	— .10
Cottonseed Oil, crude, f.o.b. U. S. mills, tanks	lb.	.10	— .10½
Summer, yellow, bbl	lb.		— .11½
Winter, yellow, bbl	lb.		— .13¾
Linseed Oil, 1 to 2 bbls., Raw, per gal. of 9 lbs.			— 1.15
3 to 5 bbls., Raw, per gal. of 9 lbs.			— 1.12
6 to 9 bbls., Raw, per gal. of 9 lbs.			— 1.10
Boiled Linseed Oil, 3c. per gal. higher than raw			
Monopole Oil	lb.	.07	— .16
Olive Oil, foots	lb.	.10	— .11

GUMS

Arabic, clear amber sorts	lb.		— .20
Regular grain No. 4 and No. 5	lb.		— .28
Regular grain No. 2	lb.		— .31
White sorts	lb.		— .35
Powdered, No. 1	lb.		— .40
Powdered, No. 2	lb.		— .39
Indian, No. 1A	lb.		— .28
No. 1	lb.		— .25
Tragacanth, No. 1, ribbon	lb.		— 3.00
No. 1, flake	lb.		— 2.00
Turkey	lh.		— 2.00

VARNISH RESINS

Congo, sorts	lb.	.10	— .11
Hard amber	lb.	.11½	— .18
White	lb.	.35	— .45
Damar, Batavia	lb.	.35	— .38
Singapore, No. 1	lb.	.39	— .45
Singapore, No. 2	lb.	.20	— .24
Singapore, No. 3	lb.	.09½	— .12
East India, pale bold	lb.	.22	— .25
Pale nubs	lb.	.15	— .17
Pale chips	lb.	.07	— .12
Black bold	lb.	.09	— .12
Black nubs and chips	lb.	.05	— .0?
Kauri, XXXXX	lb.	1.60	—
XXXX	lb.	1.25	—
XXX	lb.	1.10	—
XX	lb.	.90	—
X	lb.	.80	—
No. 1	lb.	.67	— .70
No. 2	lb.	.45	— .50
No. 3	lb.	.25	— .30
B. X	lb.	.55	— .65
B. 2	lb.	.30	— .35
No. 1 chips	lb.	.22	— .27
Brown chips	lb.	.15	— .20
Dust	lb.	.10	— .15
Manila, Bold XXXXX	lb.	.21	— .23
Nubs, pale	lb.	.18	— .22
Nubs, amber	lb.	.10	— .18
Soluble A	lb.	.16	— .18
Soluble chips	lb.	.10	— .12
Pontianac Bold	lb.	.20	— .30
Genuine nubs	lb.	.14	— .17
Genuine chips	lb.	.10	— .12

WAXES

Bayberry	lb.	.35	— .38
Beeswax, white, pure	lb.		— .38
African	lb.		— .26
Brazilian	lb.		— .34
Chilean	lb.		— .35
Refined	lb.		— .31
Candelilla	lb.	.40	— .42
Carnauba, No. 1, bags	lb.		— .50
No. 2, North Country	lb.		— .32
No. 3, North Country	lb.		— .22
No. 3, chalky	lb.		— .21
Ceresin, white	lb.		— .12½
Yellow	lb.		— .12
Japan	lb.	.19	— .20
Montan, crude	lb.	.06	— .07
Ozokerite, crude, brown	lb.	.16	— .17
Black, 158°—160°, M.P.	lb.	.18	— .19
Paraffin, 128°—130°, M.P., 250 lb. lots	lb.		— .06
118°—120°, M.P., 250 lb. lots	lb.		— .05
Parowax, blocks, 100 lb. lots	lb.		— .08¾

SHELLAC

T.N.	lb.		— .75
Superfine Orange	lb.		— .80
A. C. Garnet	lb.		— .78
Bone Dry	lb.		— .85

NAVAL STORES, FLOTATION OILS

Pine Tar Oil, crude	gal.		— .60
Refined	gal.		— .65
Rosin, G., 280 lb. bbl. lots	bbl.	7.00	— 7.50
W.W., 280 lb. bbl. lots	bbl.	8.95	— 9.25
Turpentine, 1 bbl. lots	Imp. gal.		— 1.40
2 to 4 bbl. lots	Imp. gal.		— 1.38
Less than bbl. lots	Imp. gal.		— 1.45

PETROLEUM OILS AND DISTILLATES

Mid-Continent Crude, 42 W. gal.	bbl.		— 1.45
Pennsylvania Crude, 42 W. gal	bbl.		— 2.75
Coal Oil	gal.		— .19
Fuel Oil, bbls	gal.		— .10.7
Tank cars	gal.		— .08.7
Gasoline, motor	gal.		— .24
Service stations	gal.		— .28
Gasoline, lighting	gal.		— .30
Naphtha	gal.		— .24

COAL TAR PRODUCTS

Alpha—Naphthylamin	lb.	.40	— .42
Benzol, 100%	Imp. gal.		— .50
90%	Imp. gal.		— .45
Carbolic Acid, crude, 25%	gal.		— .35
Creosote Oil, crude	gal.	.35	— .40
Refined, steel drums	gal.		— .60
Coal Tar, crude	bbl.		— 8.75
Refined	bbl.		— 9.25
Coal Tar Pitch, bbls	cwt.		— 2.00
Cresol, U.S.P., f.o.b. N.Y.	lb.	.25	— .30
Dip Oil, 25%, f.o.b. N.Y.	gal.	.25	— .30
H. Acid, f.o.b N.Y, bbls	lb.	.75	— .80
Phenol, drums	lb.	.45	— .50
Pyridine, f.o.b. N.Y.	gal.	4.50	— 5.00
Resorcinol, tech, f.o.b. N.Y.	lb.	1.35	— 1.50
Pure, f.o.b. N.Y.	lb.	2.25	— 2.35
Naphthalin, flake	lb.		— .09
Balls	lb.		— .10
Solvent Naphtha, drums	gal.	.35	— .40
Toluol, pure	gal.		— .50
Xylene, pure, f.o.b. N.Y.	gal.	.50	— .55
Comm., drums, f.o.b. New York	gal.		— .34

FERTILIZER MATERIALS

Acid Phosphate	ton	$28.00	—30.00
Animal Tankage, per unit of ammonia			— 3.50
Per unit of bone phosphate of lime			— .10
Nitrate of Sode		70.00	—75.00
Muriate of Potash	ton		—40.00
Pure Ground Blood, per unit of ammonia			— 4.00
Steamed Bone Meal	ton		—50.00
Sulphate of Ammonia	ton	68.00	—70.00

TANNING AND DYEING MATERIAL

Chestnut Liquid Extract	lb.	.02½	— .03½
Fustic Crystals	lb.	.24	— .28
Ground Sumac	ton	70.00	—75.00
Hematine Crystals	lb.	.18	— .22
Hemlock Liquid Extract	lb.	.03½	— .04
Liquid Sumac Extract	lb.	.06½	— .07½
Logwood, Solid	lb.	.16	— .19
Quebracho Liquid Extract	lb.	.03½	— .04
Quercitron Liquid Extract	lb.	.07	— .08

CRUDE RUBBER

The following quotations on Rubber are in American funds, New York delivery:—

Para, upriver fine	lb. $		— .26¼
Upriver, coarse	lb.		— .24
Caucho ball	lb.		— .25
Plantation, 1st latex crepe	lh.		— .27
Ribbed smoked sheets	lb.		— .27
Brown crepe, thin, clean	lb.		— .25½
Amber crepe, No. 1	lb.		— .26½

MISCELLANEOUS MATERIAL

Asbestos, crude, No. 1, f.o.b. Quebec	ton	375.00	—475.00
Shingle, f.o.b. Quebec	ton	55.00	—60.00
Cement, f.o.b. Quebec	ton	21.00	—25.00
Barytes, floated	ton	30.00	—36.00
Crude, f.o.b. mines	ton	9.00	—10.00
Casein, tech., bbls	lb.	.28	— .30
China Clay, f.o.b. Huberdean, Que., car lots	ton	17.00	—18.00
Imported	ton	20.00	—23.00
Feldspar, No. 1, f.o.b. mill	ton		—22.00
Firebrick, Scotch, depending on grade	M.	70.00	—80.00
American, depending on grade	M.	75.00	—90.00
Fluorspar, ground	ton	25.00	—28.00
Graphite, crude high grade	ton	30.00	—35.00
Ceylon, lump	lb.	.06	— .06½

INDUSTRIAL GASES

Acetylene, cylinders	100 cu. ft.	$2.55	— 3.00
Coal Gas, cylinders	100 cu. ft.	3.00	— 4.00
Hydrogen, cylinders	100 cu. ft.	1.50	— 2.00
Nitrogen, cylinders	100 cu. ft.	2.00	— 3.00
Oxygen, cylinders	100 cu. ft.	1.50	— 2.00

METALS

Aluminium, 98-99%, 15 ton lots	lb.		— .24
Antimony	lb.	.08½	— .09
Brass, yellow ingots	lb.		— .12
Red	lb.		— .16½
Rods	lb.		— .19
Cobalt	lb.	3.00	— 3.25
Copper electrolytic, small lots	cwt.		—15.50
Car lots	cwt.		—15.00
Casting, small lots	cwt.		—14 50
Casting, car lots	cwt.		—14.00
Gold, pure	oz.	23.00	—25.00
Iron, pig	ton		—29.30
Bar iron, base	cwt.		— 3.75
Lead, pig, small lots	cwt.		— 7.50
Car lots	cwt.		— 7.00
Magnesium, ribbon	oz.		— 1.50
Ribbon	lb.		—18.00
Powder	oz.	.60	— .65
Monel Metal, machined rods	lb.		— .50
Blocks	lb.		— .34
Shot	lb.		— .34
Sheet, hot rolled, on orders of over 500 pounds, of one gauge	lb.		— .48
rods, hot rolled	lb.		— .42
Rods, cold rolled	lb.		— .53
Nickel, shot or ingot	lb.		— .35
Platinum, pure	oz.		—124.00
5% iridium	oz.		—128.00
10% iridium	oz.		—138.00
Silver, bar, American silver	oz.		— .99½
Bar, Canadian produced, U.S. funds	oz.		— .64½
Steel, mild, ¼-inch, base price	cwt.	3.75	— 3.90
3/16-inch, base price	cwt.	4.25	— 4.50
Black sheet, 28 gauge, size 30"	cwt.		— 5.35
Black sheet, 28 gauge, size 36"	cwt.		— 5.60
Sheets, galvanized, 28 gauge, 30"	cwt.		— 7.75
Sheets, galvanized, 28 gauge, 36"	cwt.		— 8.00
Blue sheets, base	cwt.	4.50	— 4.60
Tin	lb.		— .47
Zinc, sheets	lb.		— .15
Zinc, (spelter), small lots	cwt.		— 8.40
Car lots	cwt.		— 7.90

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SOME CHEMICALS WE SELL

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Carbon Bisulphide
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Methyl Salicylate
Diphenylguanidine
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Calcium Chloride Flake or Solid
Stearic Acid
Soda Ash
Sulphate of Alumina
Sodium Sulphide
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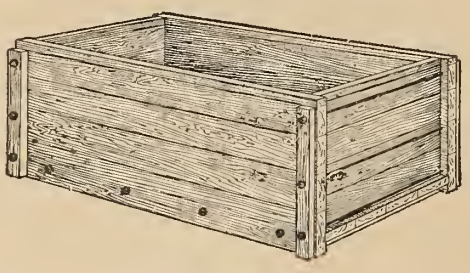

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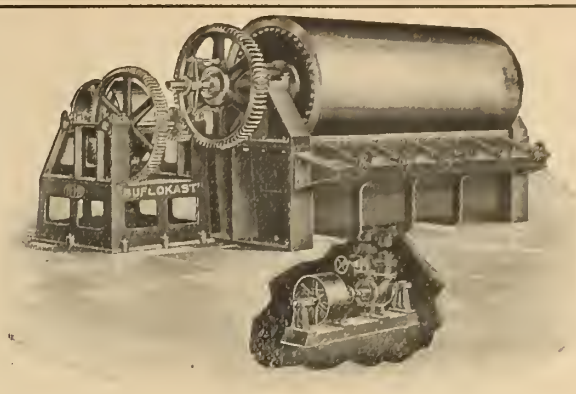

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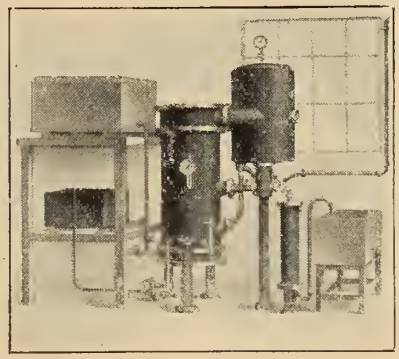

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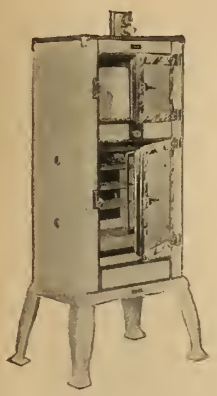

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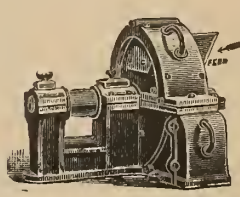

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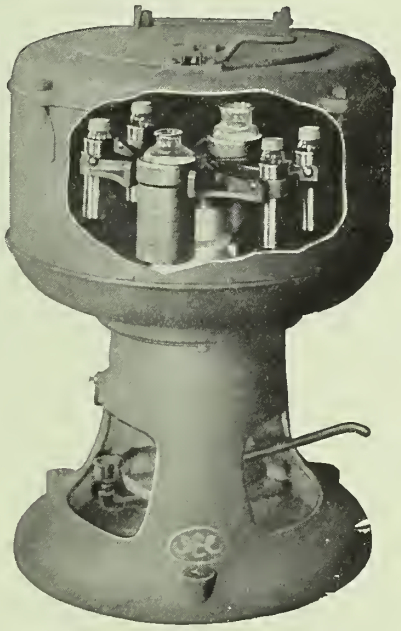
Why Use a Centrifuge?



Sedimentation and the separation of liquids can, of course, be done by Gravity, but Gravity is

SLOW,

the Centrifuge is

QUICK.

In an article by Olof Arrhenius, Journal American Chemical Society, January, 1922, p. 132, the successful use of the centrifuge in quantitative determinations by measuring the volume of precipitate is strikingly brought out, and he states that "it should be of great advantage for analytical chemistry, for the method is both TIME-SAVING and SIMPLE."

Dr. C. D. Holley, of the University of Michigan and Chief Chemist of the Acme White Lead and Color Works, in his book "Analyses of Paint Vehicles," etc. (John Wiley & Sons, Pub.), says: "By far the most convenient method of obtaining sufficient vehicle for examination is by centrifuging the paint, and in the average laboratory an ELECTRIC CENTRIFUGE is the most convenient type."

The above-quoted statements were made with specific reference to pharmaceutical and chemical work. The equal importance, however, of TIME SAVING in the analytical and testing routine of Physiological, Bacteriological and Food Laboratories is obvious to the directors of such laboratories.

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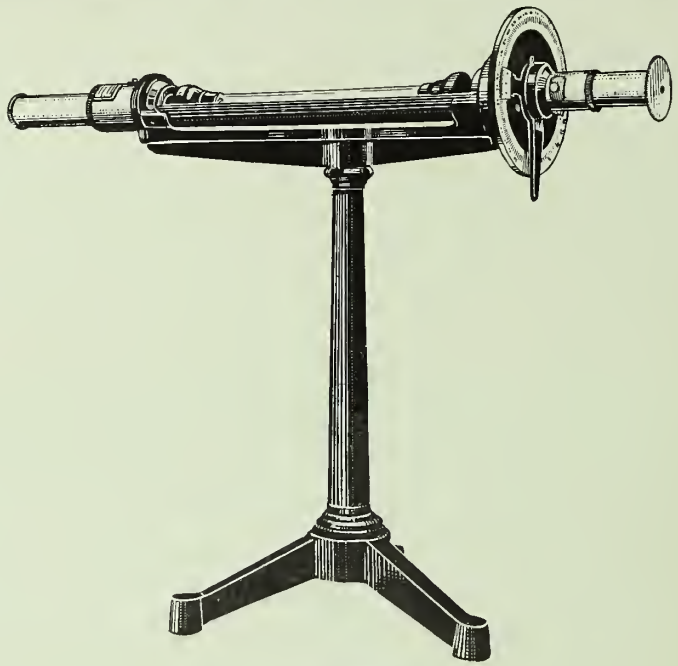

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The original Schmidt and Haensch Polariscopes are again carried as part of our large stock of Standard laboratory equipment.

The following models are stocked for immediate delivery even though the factory is about six months behind in production.

4584 Schmidt and Haensch Polariscope, Mitscherlich's pattern, supplied with a Laurent polarizer consisting of a simple Nicol prism with a Laurent plate giving a half shade field. Readings to 0.10 degree may be made by means of the vernier. This is a simple instrument of rugged construction, mounted in a tripod base. Polariscope as illustrated, including one 94.7 mm. and one 189.4 mm. observation tube, and gas sodium lamp. **Price $125.00**

4582 Schmidt and Haensch Polariscope, with quartz wedge compensation and Jellet-Cornn polarizer with dust protector and scale for direct reading of sugar in urine to 0.10%. Mounted on tripod support; complete with one 100 mm. and one 200 mm. tube. **Price $210.00**

4588 Schmidt and Haensch Polariscope for sugar analysis. With simple quartz wedge compensation, dust protector and Ventzke sugar scale, for tubes up to 400 mm., including one each 100, 200 and 400 mm. tubes. Mounted on trestle support. **Price $325.00**

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Vol. VII, No. 12 | TORONTO, DECEMBER, 1923 | $3.00 a year

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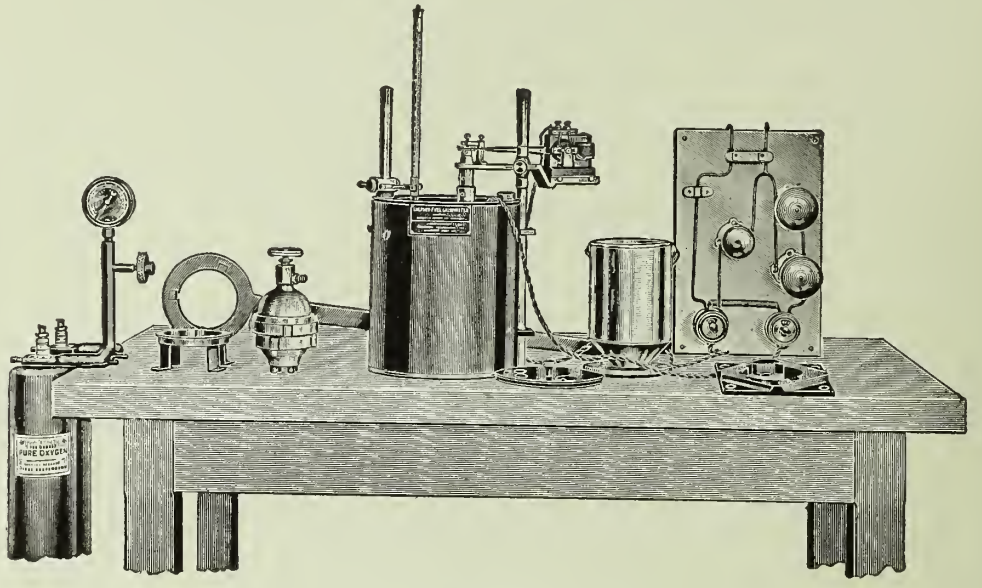
CALORIMETERS



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Careful analyses of fuels are becoming daily more imperative. For determining the calorific value (B.T.U.s) of coal or food products, the **Emerson Calorimeter** (see cut) is especially recommended. It is economical in first cost; most convenient to operate; repair parts cost least and are most conveniently obtained.

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We are glad to announce reduced prices as below of Whatman Filter Papers in Canada, effective December 1st, 1923.

Diam. in Cms.	Prices per 100 Circles — Quality No.													
	1	2	3	4	5	10	30	31	40	41	42	43	44	50
4.25	.14	.18												.50
5.5	.15	.19	.31	.24	.18	.32	.45	.45	.90	.90	.90	1.10	1.10	.80
7	.18	.24	.36	.27	.24	.36	.55	.55	.95	.95	.95	1.20	1.20	1.10
9	.22	.31	.45	.36	.31	.50	.75	.75	1.35	1.35	1.35	1.75	1.75	1.55
11	.25	.38	.51	.45	.37	.63	.95	.95	1.60	1.60	1.60	2.05	2.05	1.80
12.5	.33	.47	.67	.59	.50	.70	1.20	1.20	1.85	1.85	1.85	2.25	2.25	2.10
15	.46	.67	.95	.80	.70	1.05	1.50	1.50	2.15	2.15	2.15	2.90	2.90	2.45
18.5	.64	.94	1.35	1.17	1.00	1.45	2.15	2.15	2.90	2.90	2.90			3.25
24	1.15	1.60	2.30	2.00	1.60									5.50
27	1.40	2.05	2.95	2.55	2.05									6.60
32	2.20	3.15	4.45	3.90	3.20									10.25
38.5	2.60	3.80	5.40	4.70	3.80									12.40
40	3.00	4.35	6.20	5.40	4.40									14.20
50	4.20	5.70	8.20	7.15	5.70									18.80

Sheets	1	2	3	4	5
Per Ream 18¼ in. x 22½ in....	18.25	28.00	41.75	35.90	28.35

Whatman Extraction Thimbles

Prices per box of 25

Size in Mm.	10x50	19x50	19x90	22x80	26x60	25x80	30x77	30x80	33x80	25x90	25x100	30x100	33x94	33x118	43x123
Single Thickness.....	2.85	2.85	2.85	2.85	2.85	3.20	3.20	3.20	3.20	3.60	3.95	3.95	3.95	5.40	6.40
Double Thickness.....	4.75	4.75	4.75	4.75	4.75	5.35	5.35	5.35	5.35	6.15	6.60	6.60	6.60	9.00	10.65

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ONTARIO'S MINERALS

PROVINCE OF ONTARIO

Hon. Chas. McCrea, Minister. DEPARTMENT OF MINES *Thos. W. Gibson, Deputy Minister.*

Preliminary Summary of Mineral Statistics

(Quantities represent shipments. Tons throughout are short tons of 2,000 pounds)

Product	1921 Quantity	1921 Value	1922 Quantity	1922 Value
METALLIC				
Gold ..... ounces	709,509	$14,624,085	$1,000,199	$20,674,109
Silver ..... "	8,412,059	5,497,160	9,167,846	6,491,271
Platinum metals (a) ..... "	915	51,060	642	38,884
Copper ..... lbs.	3,070,719	356,708	4,503,358	515,093
Nickel, metallic ..... "	5,430,147	1,825,359	11,175,326	3,171,434
Nickel, oxide ..... "	1,402,019	285,391	2,399,887	391,119
Cobalt, metallic ..... "	32,718	98,228	109,067	282,602
Cobalt, oxide ..... "	155,554	354,418	398,697	798,271
Other nickel and cobalt compounds and residues .. "	108,814	114,069	1,070,935	255,034
Copper in matte exported (b) ..... tons	3,686	737,142	7,774	1,554,731
Nickel in matte exported (b) ..... "	4,850	1,939,851	8,689	3,475,649
Iron and briquettes (c) ..... "	100	459	4,304	25,261
Iron, pig (d) ..... "	82,838	2,079,729	14,052	340,730
Lead, pig ..... lbs.	3,570,222	190,843	2,895,695	173,742
Zinc (e) ..... "	.....	.....	100,283	2,181
Total metallic	.....	$27,574,202	.....	38,190,711
NON-METALLIC				
Actinolite ..... tons	78	$ 975	$ 50	$ 345
Apatite (Phosphate of Lime) ..... lbs.	.....	.....	31	248
Arsenic, white ..... "	2,982,525	233,763	4,118,695	299,940
Arsenate of Iron ..... "	.....	.....	75,000	938
Corundum ..... tons	402	50,250	.....	.....
Feldspar, crude and ground ..... "	15,506	114,059	15,515	94,985
Fluorspar ..... "	115	1,744	284	3,905
Graphite, crude and refined ..... "	363	23,273	626	34,124
Gypsum, crushed, ground and calcined ..... "	84,765	433,053	110,227	621,668
Iron Pyrites ..... "	19,375	91,604	11,235	39,763
Mica ..... "	222	29,630	2,229	56,480
Mineral water ..... Imp. gals.	.....	9,000	31,970	6,118
Natural gas ..... M. cu. ft.	8,590,000	2,953,000	7,919,390	3,902,800
Peat ..... tons	500	2,000	3,000	14,500
Petroleum ..... bbls.	172,859	466,716	164,732	439,286
Quartz and silica brick ..... tons	12,957	74,635	82,882	149,302
Salt ..... "	149,599	1,509,287	161,551	1,537,512
Talc., crude and ground ..... "	9,967	140,390	12,874	178,397
Construction Materials—($11,527,529)—				
Cement, Portland ..... bbls.	2,723,072	6,425,266	3,104,386	6,235,370
Lime ..... tons	91,355	1,172,680	116,769	1,315,479
Sand and gravel ..... cu. yds.	1,412,956	668,098	2,132,875	1,001,088
Sand-Lime brick ..... M.	.....	456,700	48,924	770,597
Stone, building, trap, granite	.....	1,812,863	.....	2,205,025
Clay Products—($5,103,618)				
Brick, common ..... M.	99,463	1,743,094	105,536	1,803,349
Brick, pressed ..... " }	31,481	673,087	{ 44,892	900,111
Brick, tapestry or rug ..... " }			{ 22,453	514,666
Tile, drain ..... "	9,910	250,040	10,110	260,312
Tile, building and floor	.....	211,529	.....	562,566
Pottery	.....	67,985	.....	88,889
Sewer pipe	.....	939,464	.....	973,824
Total non-metallic	.....	20,554,185	.....	24,011,458
Add metallic	.....	27,574,202	.....	38,190,711
Grand Total	.....	$48,128,387	.....	$62,202,169

(a) Recoveries from Canadian and United States refineries. (b) Copper and nickel exports in the form of matte were valued, respectively, at 10 and 20 cents per pound. (c) Exports and shipments to points other than Ontario blast furnaces. (d) Proportional product from Ontario ore smelted. (e) Recovery from concentrates shipped in 1919 and not previously reported.

Dividends and Bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies, or a total of $114,334,884.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

For illustrated reports, geological maps, mining laws, and list of publications, apply to Thomas W. Gibson, Deputy Minister of Mines, Parliament Buildings, Toronto, Ont.

2

STEEL CONCRETE SKYSCRAPERS IN JAPAN STOOD UP

American Earthquake Proof Construction Withstood Recent Severe Shocks.

MAY AFFECT FAVORABLY THIS TYPE OF BUILDING

Import Shipments to Go Via Kobe for Some Time, Trade Commissioner Cables.

Washington Bureau, New York Commercial.

Washington, Sept. 13.—American steel concrete buildings in Tokyo and Yokohama withstood the earthquake shock and are in good condition, according to a cable from Assistant Trade Commissioner Howard at Kobe. Officials of the Department of Commerce expressed gratification over the first practical demonstration of the effectiveness of the new so-called earthquake-proof factories and office buildings which have been constructed within the past three years. There are about six of these buildings in Tokyo. The fact that this construction has proven earthquake-proof is likely to influence favorably the adoption of this type of construction in the future.

The Assistant Trade Commi... also cables that export as wo... port shipments probably ... via Kobe for some ti... inland sea, is 200 ... vastated a... and re... surpas...

Concrete Proves its Permanence

Concrete, adopted in Japan as an earthquake-proof building material, has met and successfully weathered the severest of all possible tests—the biggest earthquake of modern times.

While buildings of less rugged construction and inferior durability crumbled under the repeated shocks or were licked up by the ensuing flames, those of steel and concrete remained unscathed. Neither quake nor fire could hurt them.

They stand to-day, in a sea of ruin, monuments to the indestructibility of concrete construction, justifying the foresight of the men who built them.

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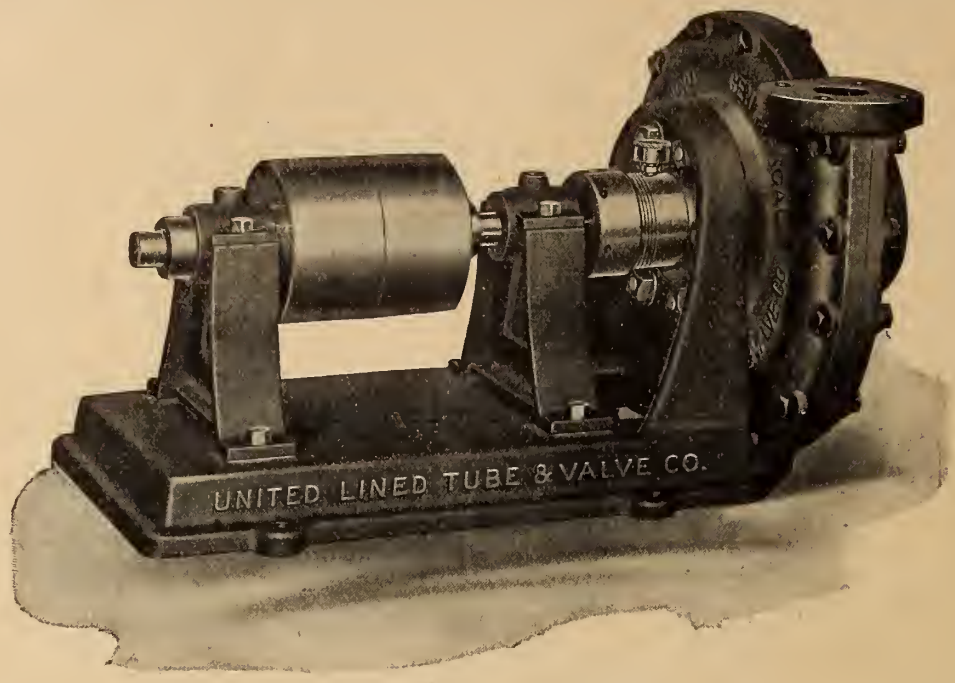

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United Acid Pumps

Should be at Work in Your Plant

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The Mineral Province of Western Canada

TO END OF DECEMBER, 1922

Has produced Minerals as follows: Placer Gold, $76,542,203; Lode Gold, $109,647,661; Silver, $59,814,266; Lead, $51,810,891; Copper, $170,723,242; Zinc, $24,625,853; Miscellaneous, Minerals, $1,358,839; Coal and Coke, $238,289,565; Building Stone, Brick, Cement, etc., $36,605,942, making its Mineral Production to the end of 1922 show an

Aggregate Value of $769,418,462

Production for Year Ending December, 1922, $35,158,843

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

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Per dozen **8.32**

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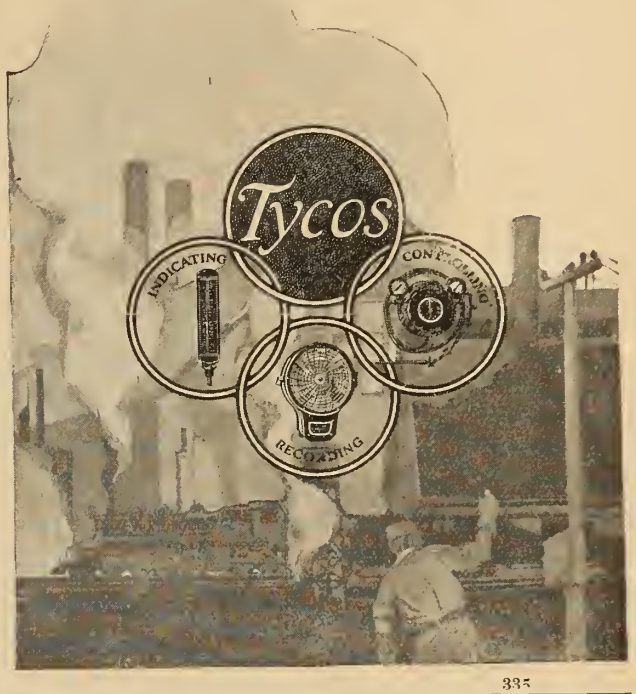

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Contents—Issue No. 40, issued Oct. 1st:

The Electrolytic Method for the Determination of Lead in Ores, Etc., by L. R. Raymond; Method for the Direct Determination of Total Calcium in Phosphate Rock, by H. H. Hopkins; Standardizing Dichromate against Thiosulphate Solution, by H. S. Martin; A Time-Saving Device for Coal Analysis, by Earle B. Caley; The Standardization of Potassium Iodate for Sulphur Determinations, by Clyde B. Gardenier; Qualitative Tests for Methyl Alcohol in Ethyl Alcohol, by Richard E. Linehan; The Determination of Copper in Alloys of Lead, Tin and Antimony, By Edward C. Kraus; A Modification of the Bismuthate Method for Manganese in Steel, by N. H. Nelson and A. Finlayson; Rapid Method for Silicon in Aluminum Alloys, by S. P. Lavins; Note on Using Wax Bottles, by Wm. B. Byers; An Improvement on the Automatic Siphon, by M. T. Matlack; Turkey Red Oil as a Laboratory Reagent, by Geo. Lake.

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EDITORIALS

THE VALUE OF AN IDEA

WHAT is the value of an idea? Can one gauge it with callipers, set out its bounds with a steel tape or weigh it in a balance? Between the epoch-making ideas echoing down the ages, ideas that have molded mankind anew, directing his footsteps into the strait and narrow way of righteousness, between these and all others, even such as have revolutionized our material progress, there is, of course, a great gulf fixed.

But what of the multitudes of ideas that have showered our homes with comforts, diminished the drudgery of the daily round, eased the burden on weary shoulders, brightened the pathway of a drab existence, satisfied the longing for beauty and harmony in color, form and tone, that in a word have lessened the limitations that time and space and matter have from the beginning of human history bound upon the shoulders of mankind. Are not then these ideas that increase the sum of our creature comforts, our health and our happiness of incalculable value, and hence worthy of their reward? The World moves apace to-day. The fear of failure should not paralyze us. Neither fate nor fickle fortune can filch from us the fruits of victory. Even a Faraday to-day need not wait for a generation yet unborn to do him honor, and few of us are Faradays. In his day the world moved leisurely. Furthermore, Faraday's greatest work was so fundamental that years passed and thousands of inventive and ingenious minds struggled and strove therewith before the world realized the boundless extent of the new realm his discoveries had brought to light.

For the pessimistic to argue that all the easy questions have been settled, all the obvious problems solved is to be expected. Let us hope fervently that the percentage of pessimists engaged in scientific work is small, for as a class they are known by their fruits. We should pause to remember that numerous discoveries that appear so simple and obvious to us from our point of vantage in the year 1923, were far from simple and obvious 100 or 150 years ago. It was as difficult a task for Lavoisier to establish the true character of combustion and for Cavendish to prove the elementary nature of hydrogen as for Thomson, Rutherford, Soddy and other moderns, more than a century later, to interpret radium and elucidate the structure of the atom. Not only have we at hand to-day to aid us in our researches, appliances and means to boot, of which our fathers never even dreamed, but the boundaries of science have been pushed back far enough to disclose multitudes of problems unguessed at by our forebears. Opportunities, completely hidden from past generations, stare us in the face. To solve them we require industry, opportunity and ideas, these three; but the greatest of these is ideas.

Some minds spout ideas as a gusher spouts oil, and sometimes like gushers they are as difficult to keep under control. But such minds are as scarce among men as gushers are among oil wells. Both are usually well advertised. Most wells require pumping, and the same may be said of most minds, at least the mind needs some sort of stimulus (stimulus, not stimulant) before it will produce. But oil from a pumped well is likely to be as good in quality as oil from a gusher, only there is not so much of it. Do not then shrink from being dubbed a man of one idea or stigmatized as possessing a single track mind. Remember many a creature who pats himself on the back as a many-sided man, thinks he has a double track mind. In reality his mind may be no better than a siding, a siding mayhap stored with precious freightage, but nevertheless a siding that leads no whither, while the single track may deliver the goods across a continent. One idea will revolutionize the world—provided the idea is big enough.

AN EMPIRE VIEWPOINT

OCCASIONALLY it takes a man with a world-wide vision of affairs in some given line to point out where we stand, and what we might do, if we wish to secure certain much-to-be-desired results. Mr. Hugh F. Mariott of London, who is distinguished as a metallurgist and geologist of note, has been treating the mining interests of the British Empire to as keen a survey as they ever received, and is taking the necessary time to point out to all concerned what he concludes are obvious relationships.

Having completed investigations in and around the Pacific, he has recently spent some time in Canada. The things that need to be pointed out most to Canadians are not that we have in reality or prospect a very fair share of wealth, but that we are organized in almost every possible way to do business, but lack a sufficient number of people to make business worth while.

There is something wrong, which cannot in full be credited to war disturbances, with our rate of development and colonization. Most Canadians need a measure of his viewpoint, when he says that Canada should be more self-contained.

Optimism is fine, but what of the work that

must be done, before Canada is independent of foreign coal, iron and oil? Our mineral wealth, or any other resource of forest and land, is valuable only as far as its presence gives us a chance to secure permanent population in a given district, during the process of initial exploitation. "Does a man work?" or "Is he a producer?" is the final industrial measure of his desirability as a citizen. In England, it is recognized that work may not be ever available for all who might desire to remain there, in manufacturing industries. These men and women desire safe and assured living, and must, of necessity, be turned back to agricultural or rural self-containment in some country. With a great many of the hardships reasonably overcome, and with quicker means of contact, by radio and otherwise, the building-up of a rural community life, that should be fairly satisfactory to those workers now unemployed, should not be impossible.

Canada appears very fair indeed to the world traveller. Thousands are anxious and willing to take their chance with us. It is not sufficient to advertise a necessity to the world; we must offer inducements. These need not be unreasonable.

While there is much merit in such broad considerations, we should not be either discouraged or unduly hurried. Let us get moving quietly but under control. If our governments or other organizations, who are deeply concerned general representatives of those now in Canada, can secure results without extreme developments in any direction, the next quarter-century should put a foundation into Canada, that can stand up against any influx, and come through with a type of citizenship that will be of outstanding credit to the world's advance in civilization.

CHARLES PROTEUS STEINMETZ

THERE is irony in the history of Steinmetz's advent to the United States, as an immigrant, who was with difficulty admitted, for fear the little cripple would "become a public charge."

But the United States, and the world at large, made up, in some measure, any slight lack of recognition of genius that may have existed. It is a happy thought that Steinmetz did receive credit while it was still worth giving.

Those who were closest to him have secured the truest picture, and perhaps Mr. C. W. Stone, manager of the Consulting Engineering Department of the General Electric Co., had more than average contact. As he has expressed himself:

"Dr. Steinmetz probably stimulated more new engineering developments than almost any other single man in this generation. He was a constant adviser and counsellor in almost any branch of engineering. Problems which seemed too difficult for others to solve were simple to him. He was never intolerant of other people's opinions, no matter how ignorant they might be, but was ever patient in explaining his ideas to anyone who asked him for them. He never hesitated to go anywhere when asked, and to work any number of hours, day or night, to help out in a difficult situation. I personally travelled with him to many places, and always found him a very happy and cheerful companion, in spite of his physical make-up. If a difficult problem of any kind arose, it simply spurred him to greater effort to solve it."

As his work was for the world, so is his loss international.

Correspondence

EDITOR, CANADIAN CHEMISTRY AND METALLURGY:

Sir:—I have read your editorial in November issue, "Employing Better Chemists," with much interest. I would suggest that its author take a trip to England for the purpose of studying technical education there. Visit the large technical schools and colleges. See for himself the magnificent chemical and physical laboratories and engineering shops. Have a talk to some of the professors, teachers and students. Then go out and visit some of the large chemical, engineering and textile works, at the same time, interview the managers, ask them their opinion of technical men, also interview some of the poor grade chemists who have entered chemistry through the "Works Laboratory." I shall be more than pleased to furnish you with a score of letters of introduction to "poor grade" chemists, whom I know well, and who have managed, somehow, to become chief chemists and managers. One of them rose from a newsboy, entered the "Works Laboratory" as bottle-washer. This boy could scarcely write his own name at the time. He went to the technical school evening classes, and by sheer dint of application and "burning of midnight oil" (in those days work started at six o'clock a.m.), while a great many university "gentlemen" were carousalling, became chemist, chief-chemist, manager and now managing-director, and is knighted.

If Mr. Editor does not return to Canada a much wiser man. Well?

I am, sir, etc.,

W. W. YEOMANS.

Montreal, Nov. 20, 1923.

EDITORIAL NOTE—Our point in the editorial mentioned was not to compare the standing of graduates of leading technical colleges in England with graduates of Canadian technical schools or universities. The comparison, if any, was rather between classes of educational institutions in Canada. While the world recognizes merit and attainment no matter how secured and while there is no guarantee that any given type of training will produce exceptional qualities the fact remains that on the average the broader the preliminary training, the better chance the individual will have. We wish all chemists to get ahead but we do not wish that either the chemists or the industries be handicapped unduly.

RESEARCH COUNCIL MEETS AT OTTAWA

Report on Nitrogen Fixation to be Issued

At the first meeting of the Research Council of Canada held since the appointment of President H. M. Tory as chairman of the council, reports were received from various special and advisory committees. The chairman of the associate committee of chemists reported regarding questions considered at the last annual meeting of the committee. The council confirmed the appointment of five new members of this committee, succeeding those whose appointment terminated this year, as follows:—

Dr. E. H. Archibald, professor of chemistry, University of British Columbia, Vancouver; A. G. Fleming, chief chemist, Canada Cement Co., Montreal; A. H. C. Heitman, general manager, Chemical Products Co., Ltd., Trenton, Ont.; Dr. D. McIntosh, professor of chemistry, Dalhousie University, Halifax; Wm. H. Thom, director and chief chemist, Lyman Brothers and Co., Toronto; Professor G. S. Whitby, department of chemistry, McGill University, Montreal.

It was decided to issue a condensed report on nitrogen fixation, and Professor J. C. McLennan, head of the physics department of the University of Toronto, is now engaged in its preparation. In connection with an investigation which has been carried on for three years into the cause of the disintegration of concrete structures in the alkaline soils of the western provinces, a valuable report entitled "The Deterioration of Structures in Seawater," was received from the Department of Industrial and Scientific Research in Great Britain and forwarded to those in charge of the investigation.

A report from the standing committee on fellowships, studentships and bursaries showed that forty-five graduate students are at present working under the auspices of the council in the science departments of various Canadian universities, all of whom are taking post graduate training in research work. A report was received from the library of McGill University, with which the Research Council is co-operating in the publication of a catalogue of scientific periodicals available in Canadian libraries, informing the Council that this catalogue will be completed by the end of the present year.

Consideration was given to the question of the utilization of Canadian cut flax straw for paper-making.

The next meeting of the council will be held in Toronto during December.

EMPIRE MINING AND METALLURGICAL CONGRESS

Mr. F. W. Field, H.M. Trade Commissioner, Toronto, announces that it has been decided that the Empire Mining and Metallurgical Congress, of which H.R.H. The Prince of Wales has consented to become Honorary President, will be held at Wembley, England, during the first week in June, 1924, and the following institutions are co-operating as convenors:—

The Institution of Mining and Metallurgy,

The Institution of Mining Engineers,

The Institution of Petroleum Technologists,

The Iron and Steel Institute,

The Institute of Metals,

representing the scientific and technical interests of the mineral and metal industries;

The Mining Association of Great Britain,

The National Federation of Iron and Steel Manufacturers, representing the colliery proprietors and iron and steel manufacturers, respectively, of the British Isles.

This is the first Empire Mining and Metallurgical Congress to be held, and it is anticipated that succeeding sessions will be held in the Dominions under the auspices of an Empire Council of Mining and Metallurgical Engineering Institutions, which, it is hoped, will be constituted as a result of the inaugural congress.

Lord Long of Wraxall has accepted the invitation of the Institution of Mining and Metallurgy to deliver the "Sir Julius Wernher Memorial Lecture" at the opening session of the Congress, and he will take as his subject "Mineral resources and their relation to the prosperity and development of the Empire. "The "May Lecture" of the Institute of Metals to be delivered by Dr. F. W. Aston, F.R.S., will also form part of the program of the Congress. Dr. Aston's subject will be "Atoms and Isotopes."

MINERAL RESOURCES OF EMPIRE IN REVIEW

The Canadian Institute of Mining and Metallurgy, at various points, is being visited by Mr. H. F. Marriott, metallurgist and geologist, of London, England. He has surveyed principal mineral resources in the Empire, attended the Pacific Science Congress as a representative of British Mining Societies. He is now making various general and specific recommendations regarding future developments. At Toronto, he addressed a public meeting of the Institute at Convocation Hall, on November 23rd. In Canada he spoke at all mining centres and large cities.

For Canada, his message was directed to the problem of becoming more self-contained in coal, oil and iron. His views on general industrial affairs, colonization and labor, were most stimulating, broad and worthy of thought. At the Toronto meeting he was introduced by Dr. W. G. Millar, provincial geologist, and the thanks of the Institute and the Ontario Government were rendered by the Hon. Chas. McCrea, Minister of Mines, and Mr. John A. Dresser, president of the Canadian Institute.

As a result of this visit, it is planned to organize an Empire Council of Mining and Metallurgical Institutions, that will get under way, following a first meeting in June, 1924, in London. This idea has received support in all quarters, and is a necessary step, under changing Empire conditions.

SYMPOSIUM ON HEAT TRANSFER

A Symposium on Heat Transfer will be held at the spring meeting of the American Chemical Society, under the auspices of the Division of Industrial and Engineering Chemistry.

While the final program is not available, a number of papers are in preparation by writers well versed in various applications of heat transference. These papers may be classified as follows:

1. Heat Losses by Radiation Plus Convection, Through Bare and Insulated Surfaces.
   - a. From Pipes.
   - b. From Furnace Walls.
   - c. From Miscellaneous Shapes.
2. Heating or Cooling of Non-Condensable Gases.
   - a. The Warming of Air in Hot-blast Heaters.
3. Heating or Cooling of Liquids Flowing Inside Pipes.
   - a. Water.
   - b. Oils.
4. Condensation.
   - a. In Surface Condensers and Water-heaters.
5. Evaporation.
   - a. The Analysis of Certain Comparative Tests on Evaporators.
   - b. Heat Transfer in Enameled Apparatus.
6. Miscellaneous Topics.
   - a. "A Heat Meter."
   - b. The Determination of Air in Steam, and the Importance of this Factor in Heat Transmission.

An Investigation of Discoloration in Corn Oil Soap and of the Possibility of Preventing Its Development*---I

By E. G. R. Ardagh, J. C. Bell, F. S. Spence and Alex. Murray

In recent years the soap industry has been compelled to look about for new sources of fats. These, it has found in fish and whale oils, and still more abundantly in certain vegetable fats and oils from the tropics, more especially cocoanut and palm oils. Olive oil foots, of course, have been used for many years. This means that the north is going to become more and more dependent upon imported oils, principally those produced in the tropics, for soap making, and importation spells dependence. Dependence is not desirable, and in this instance we can lessen it, to some extent at least, by utilizing in this industry certain of the semi-drying oils that are products of the temperate zone. The practical difficulty of making soaps from these semi-drying oils, cottonseed oil, corn oil, etc., even when they constitute only a part of the soap stock employed, is that the soap containing such deteriorates on storage, becoming covered in time with brown spots, which occasionally even become soft and rancid. It was with the object of discovering the causes of these brown discolorations and of finding out some means of preventing their formation and development that this research was undertaken.

Nature of the Objectionable Discoloration

These characteristic dirty brown discolorations occur in irregularly scattered areas on the surface of the cake of soap. They become visible at first as nuclei, darkest in the centre and shading off into the remainder of the surface of the cake. Frequently they make their first appearance on the corners or edges where the surface exposed relative to the mass of the neighboring soap is greatest. As the areas become larger, they gradually merge into one another until the whole surface of the cake takes on a dirty brown color, in appearance totally unsuitable for marketing purposes. In the samples of commercial soap examined, the discoloration never penetrated more than 1/16″ to 1/8″ into the cake.

Source, Manufacture and Characteristics of Corn Oil

The only source of maize or corn oil is the starch and glucose industry. The shelled corn, after softening by steeping, is put through attrition mills in which the kernels are broken up, but the germ left uninjured. The germ, containing about thirty-five per cent. of oil, is then separated from the remainder of the kernel in germ separators in which it floats and is skimmed off, and is then dried in revolving driers and crushed in steam-heated presses to remove the oil. The crude oil is dark-colored, being heavily charged with mucilaginous matter[9]. On refining by dropping the foots it yields a bright yellow oil, possessing a characteristic odor and taste[10].

The fresh oil contains only a small amount of free fatty acids. The content of unsaponifiable matter is high, ranging according to various authorities from 1.35% to 2.86%[10 11 12 13]. This unsaponifiable matter consists of lecithin and sitosterol[14]. The specific gravity ranges from .924 to .926 according to different observers, and the iodine number from 121 to 125. The saponification number is 189.7. The viscosity, rape oil being taken as 100, is 70.4 to 70.65[15].

The composition of corn oil was recently determined by the Bureau of Chemistry, United States Department of Agriculture, and found to contain the glycerides of:—

Oleic acid	45.4%
Linolic acid	40.9%
Palmitic	7.7%
Stearic	3.5%
Arachidic	0.4%
Lignoceric	0.2%
Unsaponifiable matter	1.7%
	99.8%

Maize Oil as a Soap Stock

Lewkowitsch[1] states "such maize oil as cannot be used for edible purposes is used for making soft soap for which it is eminently suitable. For hard soaps of acceptable quality, maize oil cannot be used." Of these statements, the latter probably refers to the characteristic discoloration of soap made from this oil.

Refined corn oil saponifies with difficulty and only after continued boiling. Saponification is best begun with caustic soda of about 15 Bé, and once started, goes rapidly to completion. Saponification proceeds more rapidly with crude oil, due to the presence of free fatty acids, the soap from which appears to catalyze the reaction. To quote Lewkowitsch[1] again: "Unless carefully refined and thoroughly saponified, soap made from corn oil is subject to rapid deterioration through discoloration and rancidity." With regard to this assertion, we were unable to prove that thoroughness in the refining or bleaching influenced the rate of reaction to any marked degree, but owing to the methods which were used in preparing the soaps, certain other effects which will be enumerated later may have more than counterbalanced the beneficent results of careful bleaching and refining.

The great affinity of sodium oleate for water (soluble in ten parts of water) causes soaps of this class containing a large proportion of this substance to "sweat," and so great is this tendency that any considerable increase in humidity is shown by the accumulation of a film of moisture on the surface of the soap. As the reaction under investigation is a surface one, this phenomenon of "sweating" in these soaps may have some connection with it. It is known that NaOH under certain conditions does act as an oxidizing catalyst, and the discoloration does seem to occur with increased speed once started[9].

General Plan of Attack

Naturally the first half of our problem consisted in discovering the cause or causes of the discoloration. The possibilities that suggested themselves to us as worthy of investigation are the following:—

(1) Influence of color of the oil.
(2) Influence of the unsaponifiable matter.
(3) Action of light.
(4) Action of oxygen.
(5) Influence of moisture.
(6) Influence of unsaturated glycerides.

(1) Influence of Color of the Oil on the Soap. Removal of Color and Mucilaginous Matter.—Our first hypothesis on commencing the investigation was that the discoloration of the soap was due to the color of and mucilaginous matter in the oil, and it was thought that if, by bleaching or decolorizing, the oil could be clarified to such an extent

*Contribution from the School of Engineering Research, University of Toronto.

that the color is reduced to a very pale yellow, we could produce a soap that would remain white and sweet indefinitely.

"Dropping the Foots."—Dropping the foots, as carried out commercially, removes a large proportion of the color. We decided to adopt this method as the first step in clarifying and bleaching, to be supplemented later on by bleaching with fullers' earth and various brands of activated carbon.

The method of dropping the foots used in our investigation and found to be most satisfactory with our oil, is the following: The oil is heated up to 140°F. and placed under stirring paddle rotated sufficiently rapidly to insure thorough mixing, but not so rapidly as to interfere with the formation of a coarse granular precipitate. Caustic soda solution (18°Bé), to which 10% NaCl by weight has been added, is run into the oil, slowly and in a very fine stream, while warming the oil up to, but not above, 150°F. Higher temperatures prevent the formation of a good-settling precipitate. Sufficient caustic solution is used to give about five per cent. excess NaOH, and the stirring continued until the precipitate coagulates. This operation generally requires about ten minutes, after which the oil is allowed to stand a sufficient time for the precipitate to settle. In some cases the precipitate would be down in twenty minutes, while in others up to four hours were required.

After settling, the clear oil is decanted from the "foots" and washed several times by running in water at about hand temperature, the oil being stirred during the process at a speed not sufficient to produce an emulsion. From such emulsions the water settles only with difficulty. The oil is dried with slow stirring at 212-220°F. so that the water boils off, leaving the oil clear and bright when dry. In every case after this treatment the oil shows traces of acidity, notwithstanding the excess of NaOH used.

The Lovibond tintometer test on one of the samples so treated was—red 7.2 on a 35 yellow base, using the standard 5¼" bottle. The untreated oil was so dark that it could not be read on the tintometer, and although subsequent treatments often resulted in a very considerable decolorization, most of the color was always removed by dropping the foots.

Method of Conducting Experiments

The oil, from which the foots had been dropped in each case, was placed in a beaker and by a small flame brought to the desired temperature (with the stirrer in operation to avoid over-heating). Weighed quantities of the bleaching agents were then added and the stirring continued for the required length of time, the temperature being kept constant. The oil was then filtered.

Series 1.	Oil	Fullers' Earth	Temp.	Time	Lovibond reading R.	Y.
(a)	250 gms.	3%	100°C.	20 min.	5.9	20
(b)	250 "	4%	100°C.	20 "	5.6	20
(c)	250 "	5%	100°C.	20 "	5.1	20
(d)	250 "	6%	100°C.	20 "	4.9	20
(e)	250 "	6%	20°C.	30 "	...	..
(f)	250 "	7%	100°C.	20 "	5.1	20
(g)	250 "	8%	100°C.	20 "	4.4	20

Note: (e) No Lovibond reading made. The result good, but not so good as 6% fullers' earth with hot solution.

As trials (c), (d) and (f) gave very nearly the same color, a sample of soap was made from (d) to determine what effect the bleaching had on the color of the soap made from the oil in comparison with that made from oil that had the foots dropped, but had not been bleached further. The glycerine was not removed.

Result: The soap from oil 3(d) was of a fine light creamy color, much lighter than that from the refined but unbleached oil.

Series 2.—To determine the effect of adding "Superfiltchar" to the fullers' earth a fourth series of experiments was run.

Trial	Oil	Fullers' earth	Super-filtchar	Temp.	Time	Lovibond reading R.	Y.
(a)	250 gms.	3%	½%	100°C.	20 min.	5.9	20
(b)	250 "	4%	½%	100°C.	20 "	5.4	20
(c)	250 "	5%	½%	100°C.	20 "	5.0	20
(d)	250 "	6%	½%	100°C.	20 "	4.6	20
(e)	250 "	6%	1%	100°C.	20 "	4.0	20

Soap made from oil from trial 2 (d) showed only a very slight improvement in color over that from 1 (d).

Series 3. L. A. SALOMON & BRO. PRODUCTS

Trial	Oil	Temp.	Time	Spec. Norite	Oil Norite	Lovibond Reading R.	Y.
(a)	200 gms.	100°C.	20 min.	3% Fullers' earth	...	5.5	20
(b)	200 "	100°C.	20 "	5%	2%	4.7	20
(c)	200 "	100°C.	20 "	...	2%	5.2	20
(d)	200 "	100°C.	20 "	...	3%	4.0	20

Results: "Oil grade Norite" proved more effective than "Special Norite."

Experiment 3 (d) using 3% "Oil Norite" is the best result obtained using a vegetable carbon alone. The use of even 3% of carbon of this nature would be very expensive practice, and considering the slight difference that this quantity makes in the color of the soap, its use would probably not be justified at all unless it is the cheapest method of delaying the appearance of discoloration. More will be said on this point later in this article.

Series 4. USING "CARBROX"

Trial	Oil	Temp.	Time	Carbrox	Fullers' Earth	Lovibond Reading R.	Y.
(a)	200 gms.	100°C.	20 min.	2%	...	5.3	20
(b)	200 "	100°C.	20 "	1%	5%	4.5	20

Comparison of 13 (a) with 8 (c) shows "Oil Norite" and "Carbrox" to have about equal bleaching effect when used alone.

Series 5—Comparison of "Carbrox," "Darko" and "Oil Norite" at 100°C. for twenty minutes. In each case 5% fullers' earth was used.

Trial—	R.	Y.
(a) 5% Fullers' earth, 2% Carbrox, Lovibond read'g	4.0	20
(b) 5% Fullers' earth, 2% Darko	4.4	20
(c) 5% Fullers' earth, 2% Oil Norite	4.0	20

The results of these tests show that "Carbrox" is approximately as efficient as "Oil Norite" when used in conjunction with fullers' earth, and that "Darko" is not quite so efficient as either of the others.

We tried several other decolorizing carbons, as well as Kieselguhr and Catalpo, and we varied the conditions under which we used them. In no case, however, did we obtain as good results as the better ones among those already recorded.

To determine the limit of the bleaching effect of "Oil Norite," a sample of the oil was treated with five successive portions of 5% "Oil Norite," filtering between each treatment. The final product still gave a reading of three red on a twenty yellow base.

Summary of the Work on Bleaching, Using Fullers' Earth and Vegetable Chars

As this phase of the investigation was merely carried out to enable us to discover if a bleached oil would produce a better keeping soap than an unbleached oil, we did not delve into it thoroughly enough to make any sweeping or positive statement about the absolute merits of the various vegetable chars with regard to their efficiency for bleaching corn oil. The comparisons made are in all cases effective only for the conditions used during the experiments, and may be quite erroneous for different conditions of temperature, acidity, alkalinity, etc. The letters on file from the makers of these carbons show that they recognize very clearly the influence of experimental conditions on the efficiency with which their products decolorize various substances. It may be said, however:—

(1) That excessive quantities of either fullers' earth or "Oil Norite" would be necessary to decolorize the oil completely, and that we were unable to accomplish that result.

(2) That "Superfiltchar" works better in conjunction with fullers' earth than alone.

(3) That "Oil Norite" and "Carbrox" are the most efficient under the conditions of our experiments of all the carbons we used.

Bleaching by Blowing with Air in the Presence of a Catalyst[18]

We were able to bleach the oil to a 3.1 red on a 20 yellow base, by adding 0.1% manganese oleate and blowing with air for fourteen hours at 85-90°C. The iodine number fell from 121 to 103.1, the viscosity rose and the smell resembled that of castor oil. The soap made from this oil was brownish and we were unable to improve its color though we tried in several ways to do so. Cobalt oleate gave similar results.

Influence of Light, Air and Moisture

In order to study the effect of these three agents, we made up several batches of soap in the manner described below:—

Method of Making Soap from Corn Oil in the Laboratory.

In the first part of our experimental work on the manufacture of soap from the oil, the method followed was to saponify the oil by boiling for several hours with caustic soda of 15°Bé. in a large evaporating dish. The saponification, once it commenced, was very vigorous for a time. After the velocity of the reaction had decreased the boiling was continued for five to six hours with an excess of NaOH not sufficient to grain the soap. In our first experiments, the glycerine was not separated, and the soaps were dried by direct heat, care being taken not to burn. As the influence of heating in producing an acid condition in the soap was not realized at the outset, and also since the soap was not salted out, the behaviour was probably somewhat different from that of properly finished soap, but nevertheless the samples were well enough made to give the desired information as to the influence of light and air.

Samples of soap were made:—

1. From oil from which the foots had been dropped.
2. From unrefined oil.

These were put away in desiccators under various conditions.

(a) In the light.
   1. With $CaCl_2$ in the bottom+air,
   2. With water in the bottom+air,
   3. Atmosphere of air.

(b) In the dark:
   1. With $CaCl_2$ in the bottom+air,
   2. With water in the bottom+air,
   3. Atmosphere of air.

3. From oil bleached with 6% fullers' earth after foots had been dropped.

4. From oil bleached with 5% fullers' earth and ¾% "Superfiltchar."

5. From "foots" filtered, but from which the oil had not been extracted.

After a period of about two months the discoloration of these samples had proceeded sufficiently to enable us to make satisfactory comparisons.

The results may be summed up as follows:—All samples placed in the light showed equal discoloration. The samples placed in the dark were colored slightly less than those in the light, but there was not really much difference between them.

The samples made from the foots while brown in color, did not show the red blotches.

A sample of commercial soap containing 20% corn oil soap was put away under the same conditions and one sample placed in an atmosphere of nitrogen.

The samples in the air showed gradual discoloration, while the sample in the nitrogen did not show any discoloration over a long period. This was our first demonstration that the oxygen of the air was a factor in the reaction.

To compare the rapidity of discoloration of soaps made from oil bleached with varying quantities of fullers' earth, samples were prepared from oil bleached with 6+6% fullers' earth and 8% fullers' earth and put away under the conditions described above.

The increased bleaching did not apparently delay the development of the discolored areas.

The samples placed in the moist atmosphere all became gummy and wet on the surface, owing to the high solubility of glycerine in water. With this fact in mind it was decided to remove the glycerine from all future samples by graining the soap several times by the use of salt, as carried out in the soap factory. The samples were subsequently dried to about 20% moisture. This salt washing removed the glycerine, but introduced another variable due to the retention of varying quantities of salt by the soap.

A sample of soap prepared from oil bleached with 3% "Oil Norite" was put away for observation. This sample was of a fine light creamy color, but it did not resist discoloration in an atmosphere of oxygen.

As results obtained up to this time had indicated that oxygen was a necessary factor in producing the discoloration, a series of samples were prepared, using oil which had been bleached with (1) 6+6% fullers' earth, (2) 8% fullers' earth and (3) 3% "Oil Norite," and the samples were put away in desiccators (1) containing oxygen and (2) containing nitrogen.

After fifteen days' standing the samples in oxygen were all discolored. They gave off a disagreeable odor similar to that of the oil blown with catalysts present, and the desiccator top was very hard to remove which indicated the absorption of oxygen. The samples which had been placed in nitrogen were not discolored. This series proved definitely that oxygen is necessary for the reaction to proceed at all, and that increasing the concentration of the oxygen increases the rapidity of the deterioration.

On testing all the other samples stored in oxygen, acidity was found to have developed in every case. This acidity was found wherever discoloration had occurred, and it increased as the discoloration increased.

Experiments to Determine the Effect of Varying Conditions on the Rapidity of Discoloration

Samples of neutral soap, free from fat, were prepared from oil bleached with 5% fullers' earth. Four samples were taken and to them was added 0.0%, 0.05%, 0.2% and 0.5% of NaOH in solution.

No comparative difference in the rapidity of deterioration could be observed after a period of one month. Possibly we should have added higher percentages of NaOH.

To determine the effect of varying the number of salt washes, (grainings), samples were prepared after, one, three and five salt washes, and set aside for observation.

The color of the freshly prepared samples improved, and the discoloration appeared to be retarded by increasing the number of salt washes. As the small quantities of soap used prevented uniform finishing, and as our results indicated that the effect of adding salt in sufficient quantity to bring about graining, retarded discoloration slightly, we thought that the results obtained here might be possibly due to salt left in the soap rather than to increasing the number of washings.

As our previous experiments had indicated that oil bleached

with 3% "Oil Norite" yielded a soap more resistant to the action of oxygen, samples were prepared from oil bleached with 3% "Oil Norite" and oil bleached with fullers' earth that gave the same Lovibond reading.

No difference could be observed in the discoloration of these samples.

Samples of soap prepared from oil bleached with 3, 6 and 9% "Oil Norite" showed approximately the same discoloration and nearly equal development of acidity.

To compare the effect of moisture and dryness, two samples were prepared, (1) finished moist, (2) evaporated further with careful heating.

After a period of two weeks, the second sample showed higher acidity than the moist sample. This result was probably due to oxidation during drying. Later experiments bore out the hypothesis that drying by heat results in the development of acidity.

A series of experiments was run to determine the effect of adding salt in various quantities to soap placed in oxygen. A large sample was divided into five portions and 0.0%, 0.2%, 2%, 5%, 7.5% salt in solution added, and the samples each dried very carefully to get approximately the same conditions.

The increased additions of salt, whitened the samples proportionately and those containing 5% and 7.5% became granular in texture. Each of these samples was cut into two pieces and placed in separate desiccators, one in oxygen over H_2SO_4, the other in oxygen saturated with water vapor.

A comparison of the color of the samples in the wet and dry desiccators, and also of the free fatty acids developed, showed that the deterioration of the soap in the saturated oxygen was much more rapid than that in which the surface of the sample was dried out. The samples with 5% and 7.5% salt developed less color than those containing smaller quantities of salt, but the result is not conclusive enough for generalization. The dryness of the grained samples containing 5 and 7.5% of salt probably was a favorable condition.

A set of samples was prepared by drying properly finished commercial soap which had 0.3% fat, inoculating the various portions with a trace of:—

(1) Salt solution; (2) Corn oil; (3) Oleic acid, and placing the samples in oxygen desiccators. From observation over a period of one month we concluded that inoculation did not in any case have the effect of starting the deterioration, the discoloration and acidity were in all the samples approximately the same after one month.

The following series was prepared by inoculating commercial soap, as removed from the kettle after finishing.

(1) No inoculation; (2) Soap heated to 100°C. for two hours; (3) Corn oil; (4) Oleic acid; (5) Water.

After one month, all the samples showed traces of free fatty acids in the surface layer with slight odor. Free carbonate is still present underneath the surface.

A series of experiments using commercial soap dried carefully over a small flame to about 15% moisture was prepared and inoculated in the same way as the preceding series.

No discoloration took place at the points of inoculation. The acidity was 2% approximately, and the odor and color development were only slight in a two weeks' period.

A similar series of samples of commercial soap which had been dried in nitrogen over H_2SO_4 were inoculated in the same way. No color development took place in a period of one month, but a slight odor of rancid soap could be detected. A comparison of these last three series indicates that the effect of heat in drying has a marked influence on the time necessary for deterioration to set in.

A series was prepared for the purpose of comparing the rate of discoloration of (1) neutral soap; (2) neutral soap with 0.5% stearic acid thoroughly incorporated at a temperature above the melting point of the latter.

The addition of 0.5% stearic acid does not appear to retard color formation.

Experiments on Oxygen Absorption

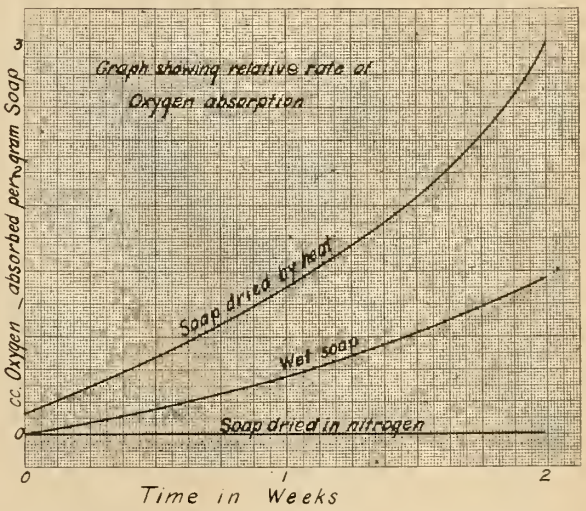
The difficulty of removing the tops from desiccators containing discolored samples in an oxygen atmosphere, and the fact that oxygen had been shown to be necessary for discoloration to take place suggested quantitative experiments to determine the absorption of oxygen. Repeated observations by connecting a manometer to a vacuum desiccator containing soap in an oxygen atmosphere, showed that oxygen was being absorbed by the samples.

As we had already learned of the development of acidity in samples of soap prepared by drying wet samples (as finished) to commercial moisture content, about 15%, the greatest care was now taken with the evaporation of the water from these wet soaps. A very small flame was used and the soap was stirred continuously to prevent overheating.

To determine the oxygen absorption of corn oil soap prepared on a semi-industrial scale we obtained through the kindness of the Palmolive Co. of Canada, Limited, a batch of properly made and finished corn oil soap. From this we prepared the following samples: (1) dried over H_2SO_4 in a nitrogen atmosphere; (2) wet finished soap; (3) dried carefully by direct heat, (as described above) to about 15% moisture content.

The samples were placed in three tubes filled with oxygen, connected to oxygen-filled water-jacketed gas burettes.

The observations on these samples showed: (1) no oxygen absorption by the sample dried in nitrogen during a period of one month; (2) medium rate of absorption by the wet sample; (3) rapid rate of absorption in the case of the heated sample. The results of these experiments are illustrated by the accompanying graph.



Experiments on the Development of Acidity

During the investigation it was proven that an acid condition was being developed concurrently with the development of color in the samples.

Determinations of the acidity were accordingly made on samples prepared in various ways. The determinations were made by dissolving the soap in 95% alcohol (neutral), titrating with NaOH solution, and calculating the acidity as oleic acid. These results may be summed up as follows:—

1. Neutral soaps which were dried with careful heating were shown to have an acid action, always less than 1%.

2. Soap dried at 105°C. for one hour was discolored and showed 9% acid. This experiment indicates the influence of

heating in promoting acidity, and also, that accurate moisture determination for soap containing unsaturated esters ought to be done by evaporation at low temperature, preferably in an inert atmosphere.

In attempting to boil soap in a large beaker contained in a calcium chloride bath at 110°C. a similar discoloration was observed on the sides of the beaker where the soap had an opportunity to dry out and in consequence to become hotter than the wet mass not in contact with the beaker wall.

3. Acidity determinations on soaps prepared from oils bleached with 8% fullers' earth, 6 and 6% fullers' earth and 3% "Oil Norite" after a period of twenty days in oxygen and in nitrogen desiccators showed 6 to 7% acid on samples in oxygen, and less than 1% acid on samples in nitrogen. The slight acidity of the samples in nitrogen is readily attributable to the effect of heating the soap in drying to the proper consistency before placing in the desiccators.

4. Experiments with commercial soap that was discolored on the outside surface, using samples taken from the outside layer and from the inside of the cake, showed that there was acidity in the outside layer while free carbonate was still present in the inside.

5. Samples cut from discolored parts of soap prepared in the laboratory and from non-discolored parts, showed in all cases considerable acidity in the discolored areas and very little acidity in the non-discolored portions.

The results of these experiments show that the development of acidity in the soap is simultaneous with the appearance of discoloration and odor, that it is due to the oxygen of the air and not to light and illustrate the effect of heating in producing initial acidity.

Extraction of Acids from Corn Oil Soap and Separation of Acids Insoluble in Petroleum Ether

From a consideration of the acid reaction of discolored soap, a method was worked out to separate this material. The discolored soap was boiled up with dilute HCl until the fatty acids split off were clear and transparent, thus indicating the complete liberation of the fatty acids. The fatty acid layer which contained the coloring matter was separated from the HCl and salt solution, and washed by repeated boiling with distilled water until free from chlorides. The acids soluble in petroleum ether were then extracted until the ether extract left no residue on evaporation. It may be mentioned that sufficient petroleum ether must be used in the first extraction, or the insoluble material which is very soluble in the colorless fatty acids remains in the solution with them and no ethereal layer is formed. After the first extraction a further petroleum ether extract is colorless. The residue that is left after extraction is completed, is a red translucent resinous substance of bright appearance. Certain characteristics of this material were determined and are noted as follows:—

1. Soluble in ethyl ether, acetone and benzene.
2. Soluble in the colorless fatty acids.
3. Insoluble in hydrochloric acid, carbon disulphide, carbon tetrachloride, petroleum ether and water.
4. Neutralization value 180. (mgs. KOH per gram).
5. Very soluble in NaOH, KOH and ammonia with some frothing.

Time did not permit a further study of the purification and properties of this material. Its identity with those acids produced in the decomposition of the corn oil soap has not been proven as yet. Two ways which suggest themselves for arriving at a decision are the following:—

1. A sample of neutral soap prepared from carefully purified oil, containing only traces of unsaponifiable matter, which has been put away and discolored in oxygen should be thoroughly mixed to secure homogeneity. From this, one sample would be taken to determine the neutralizing power to NaOH. From another large weighed sample, the insoluble acids would be extracted quantitatively, and the neutralization value of these acids determined. If these two neutralization values calculated per unit weight of soap, are the same, the results would indicate that the acid extraction yields the same material as is produced in the decomposition of the soap.

If, however, the two neutralization values are different, it would indicate that the acid reaction of the soap is due to the oxidation of the linolic or other unsaturated acids present in the oil.

2. By extracting the coloring matter present in the soap with an inert solvent and purifying this product carefully, and also the colored product from petroleum ether extraction, a systematic investigation of these two products would definitely settle the question of identity.

Experiments Carried Out to Prove That the Surface Discoloration Results From the Oxidation of the Soaps Formed From the Unsaturated Glycerides Present in Corn Oil.

Preparation A—Sodium Stearate.—100 grams stearic acid were weighed into an 8″ evaporating dish and dissolved in as small a quantity of 95% ethyl alcohol as possible. Concentrated NaOH (in water) was added carefully until a drop on the end of a stirring rod turned phenolphthalein on the spot plate red. The sodium stearate was thus slightly alkaline.

The operation was carried out over a gentle flame and on cooling, the sodium stearate appeared as a gelatinous, white, translucent material which redissolved in the alcohol present on further gentle heat and grinding the pieces in the warm evaporating dish.

Preparation B—Sodium Oleate—50 cc. of oleic acid were measured into an eight-inch evaporating dish and made neutral to phenolphthalein with a moderately concentrated solution of NaOH as described in Preparation A. The creamy, oily liquid was very gently heated and stirred continuously to drive off the moisture. After a time the mass became thick and viscous, finally assuming the character of a heavy, creamy lather.

Preparation C—Sodium Palmitate.—Some crude palmitic acid was dissolved in 95% alcohol and a strong aqueous solution of NaOH was added with constant stirring. The amber, oily liquid turned brown and not until the solution was made strongly alkaline did a precipitate form. To a portion of this mass, more palmitic acid was added to reduce the alkalinity almost to zero. The sodium palmitate was then salted out (using a solution of NaCl, saturated at room temperature), and filtered through a Buchner funnel.

Preparation D—Sodium Oleate Salted Out.—Some sodium oleate was prepared as before, only this time a solution of NaCl was added to salt out the soap. The latter was filtered with difficulty.

The tests to which these four samples were submitted, and their results, appear below:

OVEN TEST

Sample	Temp.	No. hours	Color Before	Color After
A	120°C.	3	White	White
B	120°C.	3	Creamy	Brown
C	118°C.	14	White	White
D	118°C.	14	White	Brown
D	88°C.	48	White	White
D	110°C.	..	White	Light Brown

Left in Air Six Months—
A—Unchanged.
B—Light yellow, slight rancidity.
C—Unchanged.
D—Color yellow, and has rancid odour.

OXYGEN ATMOSPHERE TEST

SAMPLE PLACED IN OXYGEN-FILLED TUBES

Sample	Time	Color Change	Time	Color Change	Time	Color Change
A	3 hrs.	None	5 days	None	8 months	None
B	3 hrs.	None	5 days	None	8 months	Slight
C	3 hrs.	None	5 days	None	8 months	None
D	6 hrs.	None	6 weeks	Slight	8 months	Very brown

REMARKS ON LATHERING PROPERTIES

Sample A—Poor in cold water.
" B—Good in cold water.
" C—Fair in cold water.
" D—Poor in cold water (due to salt).

NITROGEN TEST

All four samples remained uncolored throughout the test, the duration of which was six months.

As will be seen from the above tables, the soaps made from the unsaturated acids discolored in the presence of oxygen, but did not in the presence of nitrogen.

The next experiments bring out to what extent (1) the temperature at which saponification was carried out, and (2) the temperature of drying, affect discoloration.

PREPARATION G—SODIUM OLEATE.—28 grams oleic acid were placed in an eight-inch porcelain dish on a hot water bath, and 4 grams NaOH, dissolved in 200 cc. hot water, were carefully added. The sodium oleate formed was heated on the water bath for eight hours to drive off the moisture. It was then put in a desiccator filled with nitrogen and dried by a revolving paper pin wheel, dried nitrogen flowing through the desiccator to carry away the moisture.

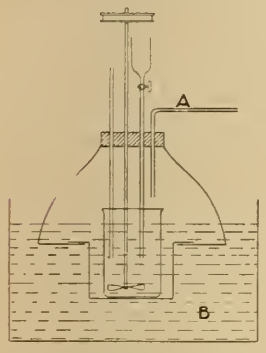


Fig. 1.
A=Nitrogen Inlet.
B=Oil Bath.

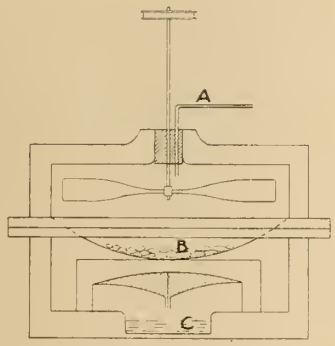


Fig. 2.
A=Vacuum Pump.
B=Soap.
C=Sulphuric Acid.

PREPARATION H—SODIUM OLEATE, 80°.—Made in the same way as G, except that temperature was maintained at 80°C. by an oil bath at 110°C.

PREPARATION J—SODIUM OLEATE, 90°.—Made in the same way as G except that temperature maintained at 90-100°C. by oil bath at 140°C. An hour was taken to add the NaOH solution. The resulting sodium oleate was clear, but dark yellow in color, similar to the color of the oxidized material.

PREPARATION K—SODIUM OLEATE, Cold.—Prepared in the same way as G, but without heating. To separate the sodium oleate formed, about 50 cc. of NaCl solution were added.

Samples of each of H, J and K were placed in ovens at 100°, 90°, 80°C.; the progress of color changes which these samples underwent is recorded in table in next column.

Sample J seems to be always more discolored than H, and in the case of K, discoloration seems a little slower in getting under way, but ends up darker than either H or J. It would appear, therefore, that there are no advantages gained by carrying out saponification in the cold. After six months all these were quite rancid.

OVEN TESTS ON SODIUM OLEATE SAMPLES

	Sample	Tuesday 5.00 p.m.	Wednesday 10.00 a.m.	Wednesday 2.30 p.m.	Thursday 10.00 a.m.	Friday 10.30 a.m.
100°	H...	Pale yellow	Slightly discolored	Same	Same	Same
	J...	" "	More discolored than H	Same	Same	Same
	K...	" "	Discolored in spots only	More discolored	Quite brown	Very dark brown

	Sample	Tuesday 3.00 p.m.	Wednesday 9.00 a.m.	Thursday 11.00 a.m.	Friday 10.15 a.m.	Saturday 10.30 a.m.
90°	H...	Pale yellow	Slightly discolored	More discolored	Still darker	Same
	J....	" "	Distinctly discolored	Same	Slightly darker	Same
	K...	White.....	Slightly discolored	Quite brown	Very brown	Very dark brown

	Sample	Monday 11.30 a.m.	Tuesday 11.00 a.m.	Wednesday 11.00 a.m.	Saturday 11.00 a.m.
80°	H.....	Pale yellow	Slightly discolored	Same	Same
	J.....	Slightly darker than H	Distinctly discolored	Same	Same
	K.....	White..	Slightly discolored	Same	Distinctly brown

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PERSONAL

Mr. A. H. C. Heitman, who has been prominently identified with the chemical manufacturing business in Canada, has resigned as general manager of Chemical Products, Limited, Trenton, Ontario, manufacturers of sulphuric acid and heavy chemicals.

This company under his direction, erected, installed and placed into successful operation a 30,000 ton acid phosphate plant, to supply the fertilizer trade.

He was for some years a member of the research staff of Parke, Davis & Co., and during the war was among the first to successfully produce on this continent, salicylic acid and its derivatives. Before coming to Trenton, he was manager of Chemical Products of Canada, Limited, Toronto, producing a variety of products, heavy chemicals, as well as pharmaceutical synthetics.

Mr. Heitman was recently made a member of the Chemical Committee of the Honorary Advisory Council for scientific and industrial research appointed by the Dominion Government.

TABLE OF THE VISCOSITY OF WATER

The Editorial Office of International Critical Tables has just finished the preparation of a table of the viscosity of water at 1° intervals between 0° and 100° C. This table is based upon a very thorough and critical evaluation of all the data available on the subject. While prepared primarily for the use of co-operating experts of International Critical Tables, a number of extra copies are available for distribution at five cents (stamps) each. Copies of the sixteen-page pamphlet entitled "Fundamental Constants and Conversion Factors" are also available at twenty-five cents (stamps) each. This pamphlet contains the latest data on the fundamental constants of nature, including definitions, dimensional equations, conversion factors, etc. For copies address the International Critical Tables, National Research Council, Washington, D.C.

Charles P. Steinmetz

The Man and His Work

The story of the work and life of the late Dr. Charles P. Steinmetz, formerly chief consulting engineer of the General Electric Co., is something that all men of science should know, and, to a great degree, have followed for a generation.

Such characteristics and such work marked out a life that became one of the really great achievements of American environment. The story of the personal element in Steinmetz is fairly well known. His views were true to his early life and his personal convictions. They were fixed, and did not change appreciably. He maintained with firmness those conditions of living that were his custom and pleasure, long after all the world would have conformed to what is generally expected of those whose station in life alters in a financial way. He believed interposing no obstacles between Charles Steinmetz and his closest friend, Dame Nature. This accounts for his simple life, and the rough surroundings of his camp along the Mohawk River, near Schenectady. Here, in summer, he worked actually on the river, or on the shore, living all day in his canoe, or in his very simple camp. Here he worked and lived, cooking his own meals, and maintaining that clarity of mental perspective, and that power for leadership in thought in his field, that made him easily the electrical giant of his time.

He has told his own story, and we record portions of it here, so that others may be stimulated, and perhaps may profit by remembering the career of one who rendered such unselfish service to industry and science, and still found pause to demonstrate human relationships that may be even further ahead of his time than were his contributions to our knowledge of electric currents.

WHEN I arrived in New York, on June 1st, 1889, in the steerage of the French liner *La Champagne*, I spoke no English; I had tried to learn it during the eight days of our voyage, but not very successfully. Towards the end of the same year I joined the American Institute of Electrical Engineers and the New York Mathematical Society (now the American Mathematical Society). In the Mathematical Society I took an active part for some years, and read a few original papers. Gradually I drifted out of pure mathematics, to my very great regret, but engineering occupied all time. My first appearance in public was at a meeting of the American Institute of Electrical Engineers.

A paper was read on the "Armature Reaction of Alternators," and I took part in the discussion, and criticised the theory as incomplete, because the third harmonics had not been considered. The author challenged the criticism by stating that the consideration of the third harmonics made the theory too complicated. I then worked out the theory including the third harmonics, and presented it as a paper before the American Institute of Electrical Engineers, months afterwards. This was my first paper read before the American Institute of Electrical Engineers. The author of the paper, Mr. Thorburn Reid, afterwards was a good friend of mine, my assistant in the General Electric Company, and assisted me in the publication of the first edition of "Alternating Current Phenomena."

As my three most important works I consider: (1) The Investigations on Magnetism (The Law of Hysteresis); (2) The Development of the Symbolic Method of Alternating Current Calculations (Complex Quantities); (3) The General Theory of Electrical Transients.

Investigations on Magnetism

(1) In most electrical apparatus magnetism is used. Sometimes the magnetism remains constant, as in the fields of direct current machines; sometimes the magnetism alternates, as in transformers. When the magnetism alternates, it consumes power. Such power consumption means loss of efficiency and heating, and it therefore is of importance to the builder of electric apparatus to make the designs so that this loss of power by alternating magnetism (called "hysteresis) is as small as possible. However, the laws of this power loss were entirely unknown, and many engineers even doubted its existence, and the designer of electrical apparatus simply built the apparatus, then tested them, and when the hysteresis loss was found too high and the efficiency too low or the machine too hot, they tried again. This obviously was not a satisfactory way. Mr. Eickemeyer, who was interested in the development of the alternating current motor, did a great deal of experimenting (resulting in a number of valuable inventions), which led the General Electric Company afterwards to buy up the Eickemeyer interests, and so I came to the General Electric Company. Now in this experimental work, I was Mr. Eickemeyer's assistant, and I had to calculate and design an alternating current commutator motor (of the same type as now used on the N.Y., N.H. and H., and other railroads), I knew there would be a loss of power in the alternating magnetism of the motor, and I wished to calculate this "hysteresis loss," to get the efficiency of the motor. I therefore looked through the literature and found two tables of hysteresis loss given, one by Ewing in his book on magnetism, and one by Kapp in his little book on alternating currents. Unfortunately, the two tables very much disagreed with each other, and the curves given by the tables differed in shape from each other. I then studied both tables and found that Kapp's table must contain a typographical error. From Ewing's table of hysteresis losses, however, I derived mathematically a law, the "Law of Hysteresis," showing how the hysteresis loss increases with the increase of magnetization; roughly, it is that every time the magnetization doubles, the hysteresis loss trebles. This law of hysteresis, as derived from Ewing's data, I published in the Electrical Engineer of December 9th, 1891. Then I started testing myself the various kinds of iron and steel and other magnetic materials which were available, and gave the results of these tests in the first paper on the law of hysteresis, before the American Institute of Electrical Engineers in 1892. The main paper, however, is the second paper on the law of hysteresis. This paper gives practically complete data on the magnetic constants such as the co-efficient of hysteresis, for all magnetic materials known at that time. Other work then withdrew my attention from magnetic investigations, but I have always remained very much interested in magnetic research, and encouraged my assistants to carry out such investigations, and some valuable papers have been the result, as the paper by my assistant, Mr. John J. Ball.

Maximum Magnetism

The second paper also gave complete data on the magnetic characteristics and the saturation values of all available known materials, that is, the maximum value of magnetism, which a material can carry. In electrical machines, such as generators and motors, the so-called "field" of the machine carries magnetism, and this magnetism, combined with the rotation, produces (or, in a motor consumes) the voltage and so gives the power of the machine. It therefore is of the greatest importance in design to have the iron of the field poles carry as much

magnetism as possible, and to be able to calculate how much magnetism it can carry. For instance, cast iron—which was extensively used in those days—can carry only about half as much magnetism as wrought iron, and cast steel—which then was just beginning to come into use for electrical machinery—is intermediate between cast iron and wrought iron, some as high as the latter. Mr. Eickemeyer then had designed and built a very ingenious instrument, the magnetic bridge, which permitted the comparison of the magnetic carrying capacity of different materials. He adopted a sample of very soft Swedish iron as standard, and gave the quality of the other iron samples in per cent. of this standard. Thus in building electric machines, when casting the field frame, a piece was cut off, turned to size and magnetically tested, and the field winding of the machine then calculated from this data. Then we made extensive tests on cast steel, for the various manufacturers of cast steel. Mr. Eickemeyer, being very much interested in magnetism, encouraged my investigations, and for a long period I spent practically all my time in magnetic research and testing, and Mr. Eickemeyer materially assisted with advice and kindness, so that considerable credit for the results of the magnetic investigations is due to Mr. Eickemeyer. Much of the work on the determination of the constants given in the second paper, was done on Mr. Eickemeyer's magnetic bridge. While this instrument had the disadvantages of giving only comparative results, when carefully handled it was very satisfactory, and its use constituted probably the first systematic testing of all the magnetic materials used in electrical machine manufacture.

Alternating Current Calculations

(2) There are two kinds of electric currents in industrial use: Direct currents and alternating currents. The direct current continuously flows in the same direction, thus can be measured in amperes, and its action calculated numerically in a simple manner. The alternating current is a current which continuously changes: It rises from noihing to a maximum, then decreasing again to nothing, reverses and rises to a maximum in opposite direction and decreases again to zero, again reverses and starts again in the first direction, and so on, reversing usually 120 times in a second. Both types of current were used since the early days of electrical engineering, and there was no difficulty in making calculations with the direct current; it had a direction and a value, which could be measured by an ammeter, and calculations made with it. But the alternating current had no value and no direction, its value continuously changed, and so the direction, and in all calculations with alternating current, instead of a simple mechanical value of the direct current theory, the investigator had to use a complicated function of time to represent the alternating current, and the theory of alternating current apparatus thereby became so complicated, that the investigator never got very far. In the meantime the practical electricians who built and ran alternating current machinery, put an ammeter in the alternating current circuit and found that some ammeters (those having permanent magnets) showed nothing, but other ammeters showed a value, and that they called the value of the alternating current. It is what we now call the "effective" or *rms* value of the alternating current. The practical engineer so got a numerical value of the alternating current, but you could not make any calculations with it. For instance, two such alternating currents combined gave a resultant current, which usually was smaller than the sum of the currents, and sometimes even smaller than either of the currents.

The invention of the alternating current transformer made it clear that electrical power transmission and distribution would have to be by alternating current. But the alternating current theory appeared almost hopeless in its complexity. Attempts were made to simplify the alternating current theory by graphical methods, and various diagrams for alternating current calculation were devised by Kapp, Blakesley and others. So I published a theory of the alternating current transformer in the *Electrical Engineer* in 1890 and in the same year in German in the *Elektrotechnische Zeitschrift*, in graphical treatment. Such graphic methods have been used and are still to some extent used, and are good in getting a conception of the relation of the different alternating currents, voltage, etc. to each other. For calculation, however, they are of very limited value. For instance, in an alternating current transformer, to get the inducted voltage, you combine the terminal voltage and the voltage consumed by the resistance. Now the former may be 125, the latter 0.5 volts, and, using 10 volts per inch, you would in graphical calculation draw a triangle with 12.5 inches as one side, and 1-20 inch as the second side. Naturally no accuracy is possible by measurement on such a triangle. Therefore, graphical methods can be used only where all the quantities which are used, do not differ much in size from each other.

All these graphical methods represented alternating currents by diagrammatic figures in a plane. Some very interesting mathematical work had been done by representing the point of a plane or surface by the complex number for instance in a very interesting investigation of the surfaces of minimum area between given boundaries, by the great German mathematician Riemann. The idea, therefore, suggested itself to represent the alternating current by a single complex number or "general number," as it is better called. This proved the solution of the problem of alternating current calculation. It gave to the alternating current a single numerical value, instead of the complicated function of time of previous theory, and thereby made alternating current calculations practically as simple as direct current calculations. Indeed the same calculations apply, except that the numerical value explaining the alternating is a general number, while that explaining the direct current is an ordinary number.

To explain the difficulty a little further, which was solved by the symbolic method of alternating current representation by the general number: the direct current has a value which can be measured, and a direction which can be measured by the sign. Thus plus 10 amperes, or minus 6 amperes; the former means 10 units of current flowing in one direction, the latter six units of current flowing in opposite direction. The alternating current continuously varies and reverses. When the practical electrician measured an alternating current and found the value 10 amperes it meant that some average of all the varying values of the continuously changing and reversing alternating current was 10 units. But there was no direction to it, as the current sometimes flowed in the one, sometimes in the other direction. But now suppose we measure a second alternating current, and also find it 10 amperes, that is, having an average value of 10 units. These two alternating currents may reach their maximum values at the same moment of time, and reverse at the same time, and when added, would give a current of 20 amperes. But the second current may reach its maximum at a different moment of time, and reverse at a different moment of time, and now when adding both, we get less than 20 amperes, because part of the time—when the one current has already reversed, and the other has not yet reversed—they flow in opposite directions, therefore neutralize each other. As seen therefore, to determine an alternating current, it is not sufficient to have merely its maximum value, but also the relation of the time when it reaches its maximum value, which is called the "phase" of the current. Now that the general number of complex quantity dies, it gives the value and the phase, and so completely characterizes the alternating current just as the simple number characterizes the direct current.

The introduction of the general number, therefore, has eliminated the function of time from alternating current theory, and made the alternating current theory the simple algebra of the general number, just as the direct current theory leads to the simple algebra of the ordinary number.

When I realized the enormous power of this method in resolving the apparently most complicated problems of alternating current theory, into simple algebraic equations, I wrote out a rather complicated outline of this new method, giving first the explanation of the method, and then its application to the more important alternating current circuits and apparatus, and presented this as a paper to the International Electrical Congress at Chicago, in 1893. This Congress was divided into three sections: theory, theory and practice, and practice. The paper was presented as the second paper of a morning session in the section "Theory." The first paper was a highly theorectical one, and to my dismay I watched one hearer after the other silently rise, edge to the door and disappear, and I began to fear that I would have no hearers left. But fortunately, just before I began, some very interesting paper in another section, which had numerous hearers, finished and was followed by a rather uninteresting paper. Most of the hearers of this section therefore left, and many of them felt it their duty to attend some more papers, and so they came to my section and filled it up again. We had an hour given to present a paper, and if needed could get a ten minutes' extension. I got two extensions of ten minutes each, and then was almost through with the introduction. . . .

Then there was no money to publish the Congress paper, and it remained unpublished for years, thus the symbolic method was unknown. In the meantime I developed it further in its application to all kinds of alternating current apparatus and phenomena, and presented it in a number of papers before the American Institute of Electrical Engineers. I believe it is due largely to the grand old man of the A.I.E.E., the ex-secretary, R. W. Pope, that these papers were accepted, and I believe practically nobody read or understood them, as might be expected, since they used the symbolic method, which was still unpublished in the manuscripts of the Congress papers.

Finally I took it up with the McGraw-Hill Publishing Company (or rather its predecessor), to publish my Congress paper on the symbolic method, and the papers following it. I thus collected all these papers, rounded it out and worked the Congress paper and the following A.I.E.E. paper on the symbolic method up into a general system, and this became my first electrical book, "Theory and Calculation of Alternating Current Phenomena," which appeared in 1897, about the same time the Congress proceedings and in them my original papers were finally published by the McGraw-Hill Book Company.

Since that time, the symbolic method of alternating current calculation has become generally known and generally used, and even complicated phenomena of alternating current distribution, such as those of the transmission line with its distributed inductance and capacity, have ceased to hold out any terror of complexity, but are easily calculated, and with the great development of alternating current engineering, in power transmission and distribution, we never have any phenomenon any more, which could not be solved and calculated.

Alternating current phenomenon dealt only with alternating currents. A series of lectures given before Union College graduate students on electrical apparatus, also dealt with direct current apparatus, and dealt with the alternating current apparatus from a somewhat different viewpoint, and so suggested publication. In the meantime, the symbolic method of alternating current calculations was new to the instructors, and so still newer to the students; also, the general number or complex quantity, though a part of elementary algebra and introduced in the high schools, was so little used that the students meeting it in alternating currents had forgotten it, and found it strange and difficult to understand. Then I wrote an introduction to "Alternating Current Phenomena," and this, together with the college lectures above mentioned, was then published as "Theoretical Elements of Electrical Engineering."

Finally, seeing the lack of familiarity of the student with the general number, and the difficulty of getting it more thoroughly understood in the high school, I wrote "Engineering Mathematics," as a complete elementary treatise on the general number, on the trigonometric series, and on the differential equation of electrical engineering, as the three mathematical tools, which are of fundamental importance in the electrical engineering and in which the mathematical preparation of the student is entirely inadequate even in the college mathematics course.

In the meantime, "Alternating Current Phenomena" increased in bulk from edition to edition, with the rapid advance of engineering, until finally it became too much for one volume, and was divided into three volumes: "Alternating Current Phenomena," "Electric Circuits," and "Electrical Apparatus."

General Theory of Electrical Transients

(3) When alternating currents had finally been conquered, and alternating current transmission lines spread all over the country, an old enemy became more and more formidable; lightning, and for many years the great problem, which pertained to the further successful development of electrical engineering, was that of protection from "lightning." But before this could be undertaken with reasonable hope of success, we had to know a great deal more about lightning and related phenomena.

This lead to the investigation on transient phenomena, first with regards to individual problems, such as the effects of lightning on transmission lines, etc. It was very soon found that while lightning may have been the criminal which started the trouble in the electric system, the damage and destruction was not done by lightning, but by the electric machine power back of the circuit, which was let loose and got out of control by the disturbance initiated by lightning, and with the increasing size of the systems, from thousands to ten thousands, and from ten thousands to hundred thousands of horse power, this danger became increasingly greater, so that for many years much of the study had to be devoted to the study of these phenomena. These in general are grouped under the name of "transients," because unlike the direct currents and alternating currents, which flow continuously, these disturbances last a limited time only—though they may become practically continuous by periodically recurring. After many specific investigations of transients had been made, and some published as papers, finally a systematic study of the general equation of the electric circuit was undertaken and published as a paper before the A.I.E.E. in 1907. Ten years afterwards, the further work in this investigation of the general theory of transients was given by a second paper, in 1917, and later in a third paper.

All this work of transients then was collected and systematically rounded out and published in the book "Theory and Calculation of Transient Electrical Phenomena and Oscillation."

While this makes it possible to systematically study and calculate the transient phenomena, which are all the undesired electrical phenomena of our electric circuits, the work is not completed but still in progress.

PERSONAL

Dr. Charles Camsell, deputy minister of mines for Canada, arrived back home on November 17th after two and a half months in England and Europe, where he attended the Imperial Economic Conference as a delegate from Canada. In addition to attending the conference, Dr. Camsell visited various places in France and Germany and devoted considerable time in investigating the advances made in these countries, and to some extent in England also, in the scientific utilization of coal.

Chemical Society News

Containing Official Announcements of the Canadian Institute of Chemistry

REPORT ON THE OPINION OF INSTITUTE MEMBERS ON THE QUESTION OF ORGANIZED CONSIDERATION OF PROBLEMS ARISING IN THE SETTING OF FEES AND STANDARDS FOR CONSULTING WORK, REPORT MAKING AND ANALYTICAL DETERMINATION

Following the authorization of the Council of the Institute, the Secretary submitted a questionnaire to all members in Canada. This, in a very general way, gave members the opportunity to submit their opinions on the advisability of creating some activity within the Institute along this line, and, to some degree, determined those who might be counted upon to be active in this connection.

Without considering two replies, from individuals who are not interested in any practical way, opinions were received from thirty-three members. This is a very good return, and is representative of views in various parts of Canada. In addition, the attitude of individuals quite differently situated, concerning all phases of the question, was secured.

Without exception, all replies indicated that there was a great necessity and desirability for some co-ordinated action, although one member was not certain that benefits would accrue, if anything were undertaken. The great majority believe that something should be attempted, and they have expressed themselves as personally prepared to assist.

Those in Eastern and Western Provinces have, to some degree, individual problems, and the same amount of co-operation could not be undertaken that might be found possible in Ontario and Quebec. No one felt that the matter was beyond the field of the Institute, although the necessity for a clearly-defined policy in this connection was recognized.

In regard to analytical work, it seems clear that the fees secured are not considered sufficient. Chemists interested particularly in consulting work consider that some general statement of standards might be set up with mutual profit. The feeling expressed is that the flexibility or range is too great, and that, in many cases, no return is received for a very consider able advisory service.

The individual circumstances of many Institute members creates a variety of opinions and viewpoints, and it is apparent that a better general understanding and agreement on the part of all members and chemists in Canada would, in itself, be a considerable forward step within the profession.

If any general conclusions are possible from this survey, they would appear to be:—

1. That those chiefly concerned within the Institute are in agreement that the Institute might well attempt to lead in this direction, by offering to guide and assist in the necessary organization.

2. That a tariff for analytical determinations might be set up after due consideration, that would be taken as a proper and fair charge for specific work, carried out in a laboratory under the direction of an Institute member.

3. That, since it is agreed by all that rates now charged are, in many cases, lower than they should be, the setting-up of such a standard rate would tend to maintain a proper fee and be of benefit to all concerned.

4. The development of a rate for analytical work might well be based on a scientific appraisal of the cost, plus overhead, on the basis that even so-called routine work be carried on by individuals receiving wages at least equal to those available to the more skilled mechanical trades.

5. By closer co-operation and more cross-checking, the standards of practice and accuracy might be very considerable improved.

6. The introduction of ordinary business principles to the question of consulting fees, report making and analytical work, would tend to strengthen the profession and create standards that would have some backing and strength as an educational influence among those who require or accept the services of Institute members, qualified chemists or chemical engineers.

7. Quick success in such plans depends upon the degree to which Institute members are influential, and the willingness with which all chemists in Canada adopt and respect any standards that may be agreed upon. Although the Institute, as at present constituted, does not include all consulting chemists, or all analysts and assayers, it does represent the large majority, and should be able to secure fairly rapid progress, after arriving at a decision agreeable to all members.

8. It is clear that, with the interest existing in these problems, the time is most opportune for a general discussion at the next annual meeting, which should be led by the submission of definite proposals for consideration.

9. The setting-up of any printed standards, rates or guides to professional charges, and the printing of the names of Institute members or companies directed by Institute members, as subscribers to the same, would initiate a co-operative means of developing profitable business, through legitimate advertising. Somewhat similar developments have been found to be satisfactory in other lines of work, and in other professions.

The whole matter resolves itself into a test case of the ability of chemists to organize themselves in a business-like manner, so that they may not be their own chief enemies, when dealing with matters where it is necessary to set a proper fee for professional chemical services. At the same time, such fees should not exceed the point where they operate against the creation of business.

The problem is fairly clear to all, and it is doubtful if it will settle itself or improve without some effort on the part of those chiefly concerned. Some definite action along this line may be anticipated following the next meeting of the Council, which will be held early in January at Montreal.

MONTREAL SECTION, SOCIETY OF CHEMICAL INDUSTRY, HOLDS SUCCESSFUL MEETINGS

The Montreal Section of the Society of Chemical Industry held its first meeting of the season at the Queens Hotel on Monday, October 29th. It was preceded, as usual, by an informal dinner, at which fifty were present.

The chairman called on the chairmen of the various committees in turn to give an outline of their plans for the coming season, and the reports given augur well for the success of coming meetings.

The most interesting item on the program was a paper by F. A. Bert on "Serums," together with the subsequent discussion, which took an altogether unexpected turn.

Mr. Bert first defined a serum, explaining the difference between serums and vaccines. He went into a detailed description of each step in the production of anti-diphtheric serum, which he took as example, and of the very careful control required at every stage to ensure that the final product will be properly standardized.

After Mr. Bert had finished giving his paper, S. L. MacBean, who introduced himself as a member of the Anti-Vivisection Society, rose and asked for a hearing of views on the other side of the question. He then made an attack on serums and vaccines in general, supported by the usual line of so-called statistical proofs in confirmation of his views.

Chairman F. W. Horner then called upon Dr. Maxwell Lauterman to answer the objections voiced against serums and vaccination. The choice was a happy one, as Dr. Lauterman was so fortunate as to have had the opportunity of studying under both Pasteur and Ehrlich, whom he acclaimed as two

men who had done more to mitigate the sum total of human misery than all the men who had preceded or succeeded them. He sympathized with conscientious objectors, because they did not know and did not understand what serums and vaccines really were and the immense amount of suffering relieved through their agency. He then proceeded to answer specific statements of Mr. MacBean, showing that the increase in deaths from diseases such as cancer and tuberculosis were due to living conditions under our modern civilization, and not to the extension of the use of serums and vaccines.

Dr. A. R. M. MacLean brought up the question of forest protection, and read a few statistics which forcibly drew attention to the urgent necessity of taking strong measures without delay to put a stop to the appalling waste which is going on and which threatens to cause an acute shortage of wood and all its products in the not distant future. The meeting appointed the following committee to investigate the subject and make recommendations: A. R. M. MacLean, chairman, J. B. Bell, Canadian Explosives, Ltd., A. Neighorn, Nichols Chemical Co., E. A. Smith, Standard Chemical Co. The committee was empowered to add to its number if it saw fit, and R. A. McInnis, mill manager, and R. W. Hovey, superintendent of Service Department, both of the Abitibi Power & Paper Co., Iroquois Falls, Ont., have consented to act as honorary members of the committee.

It was announced that competition for the prize of $50 offered by the Section for the best essay by senior chemistry students on their personal experience in a chemical industry would be open to the students of the University of Montreal and of the Ecole Polytechnique as well as to those of McGill University.

Chemistry—A National Asset

The Section held its second meeting on Monday, November 19th, and it was even more successful than the first one. There were seventy-five guests at the informal dinner, while many more came after and fully 100 were present to hear Dr. Chas. T. Herty speak on "Chemistry, a National Asset."

Dr. R. F. Ruttan said a few words on the patent legislation which had been passed by the Canadian Parliament at the last session. He informed the meeting that the agitation of the chemists while the patent bill was before the House had had excellent results, and that practically all their recommendations had been embodied into the Act. Unfortunately, the regulations issued by the Commissioners of Patents contained certain sections which could easily have a most disastrous effect on Canadian chemical industries. The main point stressed by Dr. Ruttan was the restriction of search to previous Canadian patents. Choosing as example the manufacture of hydrochloric acid from salt and sulphuric acid, he said that according to the procedure laid down in the regulations nothing would prevent anybody from taking out a patent for this process. He showed the danger arising from unscrupulous promoters taking out worthless patents and collecting funds on the strength of these patents. This would eventually undermine the confidence of the investing public in the soundness of the chemical industry in Canada. The meeting passed a resolution authorizing Dr. Ruttan to cite the Montreal Section as supporting the protest which he is to make at Ottawa regarding these regulations.

Dr. Herty prefaced his main address, which he described as a "rambling talk," with references to a number of British chemists whom he had met during the past few weeks in London and in Paris, many of whom were well known to the gathering as visitors here two years ago. He boldly endorsed the French stand on reparations: he had been in both France and Germany just after the war, and the contrast between the devastated regions and the untouched soil of Germany has made him an advocate of making Germany pay to the limit. France was frequently accused of being militarist; but on his recent visit he had found the French working hard at reconstruction, and the main question which was discussed by the chemists present at the Third International Congress of Applied Chemistry was the application of chemistry to agriculture.

There is much talk at present throughout the world of the transfer of existing wealth; but chemistry was an agent which created wealth from undeveloped or hitherto wasted materials. Big and small business institutions were coming more and more to realize that in such matters as the testing of supplies, the perfecting and superintending of manufacturing processes and the elimination of waste, the services of the trained chemist were invaluable, for he substituted scientific certainty for guesswork or rule-of-thumb methods. The actual creation of value and wealth is well exemplified by the production of calcium carbide from lime, coke and electric energy. The chemist takes these three raw materials, of relatively small value, and transforms them into a much more valuable product which is but the first step in the production of numerous products of even greater value, such as acetylene, acetaldehyde, acetic acid, etc. Another instance to point is the phosphorous industry of the south of the United States, which transforms phosphate rocks into products which have about 24 or 25 times the value of the raw material. Other instances were given along these lines, all tending to show the tremendous value of the work of the chemist to the prosperity of a country. The speaker paid a tribute to the work of Dr. Banting as the discoverer of insulin and to the Canadian Parliament which granted him an annuity that would enable him to devote his life to research for the good of humanity; and he suggested it would be a good investment for governments and business men to provide endowments which would enable gifted chemists to carry on work which would benefit their nations and the whole world.

The speaker then proceeded to emphasize the necessity of popularizing chemistry, that is, of making the mass of the people familiar in a general way with its potentialities. In order to be successful, this must be done as an educational proposition for the good of the nation, and not as propaganda for the chemists. He described what has been and is being done at present in the United States in this respect by the American Chemical Society News Service, and the gathering was particularly fortunate in having the history of this movement described by one of its originators and most ardent supporters.

On motion of Professor Evans, of McGill University, Dr. Herty was asked to represent the Montreal Section in New York on the occasion of the presentation of the Perkin Medal for 1923 to Dr. F. M. Beckett, a native of Montreal, and a graduate of McGill University.

QUEEN'S STUDENT BRANCH OF INSTITUTE HOLDS MEETINGS

At the first meeting of this Branch six new members joined up. Under this student organization it is planned to hold regular meetings. As a start the picture of the Spanish River Pulp and Paper Company entitled "From Spruce to News Print," was secured. The Students' Branch and the Department of Chemistry are indebted to this company for their kindness in loaning these very fine films.

At the first meeting of the Branch, held October 30th, Mr. N. Van Patten, librarian at Queens, gave a very interesting address on "Short Cuts in the Use of Chemical Literature," giving many practical hints that would prove of considerable value to the student of chemistry in his reading of the literature.

The officers of Queen's Branch are as follows:—Hon.-Pres.—Dr. A. C. Neish. President—R. W. Beattie. Vice-President—D. S. Pasterhack. Sec.-Treasurer—A. G. Muirhead. Committee: Staff Member—Prof. R. L. Dorrance; Grad. Member—R. H. Manske, B.Sc.; Student Member—A. L. Kuehner.

EDUCATION IN RELATION TO SCIENCE

The regular monthly meeting of the Ottawa Section, Society of Chemical Industry, was held at the University Club, Ottawa, Thursday evening, November 8th. The address of the evening was delivered by the chairman, Dr. A. E. MacIntyre, who spoke most instructively on the subject "Education in Relation to Science."

Dr. MacIntyre said in part:

"Frequently learned men are divided into two classes. Those who gather knowledge and seclude it; and those who disseminate it for the benefit of fellow men. The scientist belongs to the latter class. The prevailing opinion that scientists are poor narators of their own achievements and knowledge is not justified. The scientist, as a rule, is not appealing to the ordinary reader, therefore his contributions are not literary art, but scientific prose containing accurate statements. Chemists are accused of giving very long names to chemicals, but this is necessary in order that the compositon and constitution of the compounds may be clearly stated. The trade names of substances have no chemical meaning and are largely adopted for convenience.

"The charge of a well known author that "the man of science appears to be the only man in the world who has anything to say and he is the one man who does not know how to say it,' cannot be accepted as true as many scientists have been exceedingly able writers, the inability of many persons to understand scientific authors is due to faulty education. While science is steadily progressing, art and literature is in a state of decadence, and there is a paucity of outstanding figures among its followers. Science demands of its followers truth, and 'about' or 'nearly,' while good enough for the ordinary man, does not satisfy the scientist.

"The 'Whisper of Death' has intimated that Canada is deficient in men capable of governing and administering the affairs of this country, and there are those who believe that the same applies to men of science.

"If these statements be true, there has been either a decadence in the mental capacity of the people, or their educational development. Education has always been a very much debated question, and within the past year much has been said and written upon the subject, particularly as applied to science.

"The premier of this province, Hon. Howard Ferguson, has intimated that in the school there is too much memorizing and cramming, in an endeavour to make the youngster remember, rather than think. Ontario is not the only country suffering from such a state of affairs, as, according to American educational authorities, the scholars of to-day are trained to learn rather than to think. Such a system will never develop a body of scientists with original and progressive ideas, and research of high order cannot be expected. Research workers are scarce enough under the best educational conditions, but a continuance of such methods as the foregoing, will not tend to increase the number."

The criticisms by a number of European exchange professors upon American Universities were cited, and also that of Sir Jos. J. Thomson upon the position of research in U.S.A. Dr. MacIntyre expressed the opinion that the criticisms were justified, and pointed out that, although America produced over 85 per cent. of the world's output of non-benzenoid hydrocarbons practically all the chemical research upon these compounds had been performed by European chemists, and that the principles involved in manufacture, were the same as those introduced, in Scotland, over 70 years ago.

The part that the text book plays in the education of the scientist was condemned. This fetish had outlived its usefulness and students and scientists should consult the original contributions. The value of reading was considered, it being pointed out that literature was not education, but merely an instrument by which it could be obtained. The cultivation of the memory was touched upon, and the difference between the mechanical and logical phases of its explained.

Imagination was one of the chief assets of the scientist, and its value and features were pointed out. A disciplined imagination was necessary, and this, combined with experiment, was the basis upon which science made its progress.

While dealing with the attributes and qualifications of the scientist, reference was made to industry, and in this connection it was pointed out that capital and labor generally considered that they alone created wealth. As a matter of fact they played a less important role in its creation than did mind. The fine chemicals, from the worthless coal tar, were created by mind, and the same applied to everything developed by science.

In closing, Dr. MacIntyre urged that the injunction expressed in the Prayer Book be applied in the study of the sciences—"read, mark, learn and inwardly digest."

Discussion

Each speaker taking part in the discussion expressed much appreciation of the very thoughtful address given by the chairman.

Dr. Shutt expressed the opinion that we were perhaps too ready to blame our educational system for the failure to develop more outstanding chemists, while he thought the fundamental underlying real success was a love and great enthusiasm for the science of chemistry.

Mr. Connor thought our educational system tended to develop too many men whom he referred to as "rough lumber."

Mr. Peak suggested that a man might know so much, as to be of no value to a firm, and contrasted with such a man an Italian who began as a scrub boy with no preliminary training but who became a most useful individual in the laboratory. Any process of education he thought must develop reason which will give the individual pleasure in its use. Many people are not qualified by nature to acquire a scientific education.

Mr. Hambly thought the paper had a real significance for all scientists. Referring to reading he said that learning to read and digest our reading is most important and that men of preeminence in science have not confined their reading to their particular line only. He strongly recommended the reading of Haveloch Ellis' book, "The Dance of Life."

Dr. Atack referred to the attachment of some men to recipes and the fact that such men frequently are given appointments on basis of this qualification. Journal reading, he thought, should be followed with caution in order not to clog the brain, but leave it free to think. He suggested "read as much as possible, forget most of it, but remember where to get it." He stressed the value of imagination and thought that probably the accumulation of so much scientific knowledge in Britain was due to the fact that many chemists may exist in colleges there at research work on a mere pittance.

Dr. MacIntyre replied briefly to the points raised in discussion and thanked the audience for their expressed appreciation.

ACTIVITIES OF THE BRITISH CAST IRON RESEARCH ASSOCIATION

Research Department

Semi-Steel—During the recent visit of Dr. Moldenke of America to England, he expressed some very interesting remarks as to the manufacture and nomenclature of Semi-Steel. There is no doubt that a better name should be found for it, and there is equally no doubt that better methods of manufacture will have to be adopted if its production and use are to progress. The Association has carried out numerous investigations for its members and has colledcted a large amount of data upon

the methods adopted by various makers. Although the Association are not yet in a position to state that definite conclusions have been arrived at they can offer considered advice to its members upon the best melting practice to adopt. This has been done in many cases with the result that mixture and melting processes have been improved. When the Association has completed its investigation, there is no doubt that it will be able to make such a report to its members as will enable them to produce a material that will be of widespread use.

CARBON BLACK, INDUSTRIAL HYDROGEN AND MOTOR FUELS DISCUSSED BY SHAWINIGAN SECTION

A meeting of the Shawinigan Falls Section of the Society of Chemical Industry was held at the Cascade Inn on Monday evening, October 15th. Dr. F. W. Skirrow presided in the absence of Mr. R. A. Witherspoon, the chairman.

A very interesting paper by Mr. S. A. Wisdom was read, entitled, "Carbon Black." Mr. Wisdom has been employed for some time by the Canada Carbide Company on research work in connection with the manufacture of carbon black from acetelyne, and is now operating a fair-sized plant for its production in commercial quantity.

On account of the patent situation it was impossible to give out much information on carbon black from acetelyne, but the writer described in an interesting manner its manufacture in the ordinary way by incomplete combustion of natural gas.

The manufacture of this valuable product permits the utilization of natural gas deposits in remote places which would be otherwise useless on account of the prohibitive cost of piping to industrial centres. The low cost of the plant allows it to be dismantled in case the well runs out, and moved to a new locality.

Carbon black has the property of extreme fineness and possibly shows the greatest state of subdivision of any known solid. Its principle use is as a filler for rubber in automobile tires, and to some extent in rubber shoes and other kinds of rubber goods. It is in a different class altogether from other fillers, in that it not only acts as a diluent but also imparts valuable properties to the rubber, making it wear longer, preventing hardening and cracking, and reducing its tendency to slip on a wet surface. On account of these advantages its use in pneumatic tires had become almost universal.

After the paper was read, refreshments were served, and a lively discussion of the subject took place.

The Shawinigan Section intends to hold monthly meetings during the winter which will be of an informal nature and consist for the most part, of the reading of papers by local men.

A meeting of the Shawinigan Falls Section of the Society of Chemical Industry was held at the Cascade Inn on November 21st.

Dr. F. W. Skirrow presided in the absence of Mr. R. A. Witherspoon, the chairman, and after the routine business was disposed of called on Mr. G. S. Shaw who read a very interesting paper on Industrial Hydrogen.

In this paper a review was made of the new uses of hydrogen, chiefly in hydrogenation and in the synthesis of ammonia. It was pointed out that in the manufacture of synthetic ammonia the main cost item was that of preparing the pure hydrogen and nitrogen. The chief industrial processes in use to-day were described, emphasis being laid upon the steam-iron method and electrolytic hydrogen. This last method was the most interesting to Shawinigan Falls industry on account of the cheap power available there. The cost of power in Shawinigan was within the limit set by the cell manufacturers as necessary in order to compete with the costs of the other methods for the manufacture of pure hydrogen. A description was also given of small installations generating hydrogen for experimental purposes with small outlay of capital, although higher cost per unit of hydrogen.

Mr. H. S. Reid followed with a paper on automobile motor fuels.

He discussed the growth of gasoline production in the United States from about a quarter of a billion gallons in 1904 to a billion and a half in 1914, nearly five billion in 1920, and finally about six and a quarter billion in 1922. This at first came entirely from straight distillation of crude petroleum, but later was augmented by the light oils compressed from natural gas, and still later by "cracking" the heavier oils of petroleum. The cracking processes are becoming more efficient, and at present about 20% of the gasoline supply comes from this source.

Of the present world's production of about 850 million barrels of petroleum, considerably over half originates in the U.S. and yet they have to import 36 million to supply their demand. The other important producers are:—Mexico, Russia, Dutch East Indies, Persia, South America and Rumania.

It is estimated that at the present rate of consumption, there are reserves in sight to last a thousand years, but unfortunately, these are not well distributed, and some of the principal consuming countries find it hard to get adequate supplies.

If the shortage became severe enough to greatly elevate the price of gasoline, shale oil deposits could be worked which would greatly increase the supply.

Ethyl alcohol is an ideal motor fuel and is used as a substitute for gasoline in Europe, but can never come into very general use on account of the restricted supply. If the three main sources of cheap alcohol in the U.S., were thoroughly exploited, viz., corn, molasses and wood waste, the resulting alcohol would run the motors of the country for only nine weeks.

Benzol is also a satisfactory motor fuel, but the possible production is also inadequate. Mixtures of benzol and alcohol were used with success in Germany during the war, and are used to-day in such countries as Sweden which are unfavorably located as to gasoline supply.

The quality of gasoline can be much improved by proper admixture with small amounts of other substances such as ethyl lead, aniline and iodine, and considerable research work is being done in this field. The General Motors has lately put on the market a gasoline treated with "ethyl fluid" which is said to largely eliminate knocking and carbon deposits.

In discussing the papers Dr. Skirrow suggested that in the future the two subjects, hydrogen and motor fuels might not seem so remotely related, and recalled certain experiments in Germany where artificial coal, made by exposing wood fibres to immense pressures, had been further changed to a petroleum-like substance by treating it with hydrogen, also under pressure, thus possibly reproducing the way in which nature makes our oil deposits.

The next monthly meeting of the Section will be held about December 15th and will be addressed by Mr. C. E. Moore on the textile industry.

F. E. Dickie,
Secretary.

IMPORTS OF IRON ORE BY GERMANY

Germany, which before the occupation of the Ruhr, imported huge quantities of iron ore from the British Empire Steel Co's. mines in Newfoundland will do so again, when, and if, she is allowed again to control her own industries. The authority for this statement is Hugo Stinnes, the great German industrialist. He made the statement to Dr. Camsell, deputy minister of mines for Canada, in the course of a recent interview. In the interim Germany is importing what she requires from Scandinavia.

OIL REFINING METHODS REVIEWED

Although the weather was anything but favorable there was a very good representation of members present at the regular meeting of the Toronto Section, Society of Chemical Industry, held at Hart House, Friday evening, November 23rd. Professor J. T. Burt-Gerrans, chairman of the Section, occupied the chair.

A review of oil refining methods was most ably presented to the Section by Mr. W. A. P. Schorman, Chief Chemist, British America Oil Co., whom, the chairman pointed out, had very kindly consented on very short notice "to fill in the breach" caused by the scheduled speaker of the evening being unable to appear.

The members of the Fourth year in Chemical engineering were present as guests of the British America Oil Company, and many of Mr. Schormans' remarks were directed especially towards the impressing on students in chemistry of the great possibilities that await further study and reaserch in oil refining. While some of the improvements made in oil refining practice had been due to accidental discovery, yet, by far the most progress had come by careful research work extending in many cases over a considerable length of time.

The first stills were simply condensers in which, by means of steam agitation, separation of some fractions occurred but the remaining fractions, now so valuable, were wasted. The knowledge that valuable fractions were being lost led to the next step which was the introduction of the fractionating towers, some of which were built as high as eighty feet. As many as five fractions were removed during the passage of the vapor upwards through some sixty feet of tower. The final stage of development was the so-called Trumble Still. In these, the incoming crude oil passed through heat exchanges of tubular shape and then entered an evaporator column where the lighter hydrocarbons are volatilized.

Continuing, the speaker briefly outlined several of the best known of the Liquid-Phase Cracking Processes, The Fleming, Dubbs, Snodgrass, Cross, Ellis, Burton-Clark, and Holmes-Manley.

The important factors are those of temperature, pressure and time, and of these time is the most important.

In the Holmes-Manley process, the chief feature is the addition of chambers fitted with scrapers for removing the carbon from the sides.

Reference was made to the remarkable growth of the motor car industry. There are to-day over thirteen million gasoline-driven vehicles in the United States, and it has been estimated that were all these cars and trucks placed along the Lincoln Highway which stretches for over 3,000 miles from coast to coast, it would be necessary to place them in close formation fifteen abreast to accomplish the feat.

The speaker was not worrying about the future supply of motor fuel, and was of the opinion that the warnings thrown out about the declining supplies of petroleum had been much overdone. During the past summer, production of gasoline had so far overtaken consumption that it was found necessary to close down many of the refining plants in the United States, temporarily, so as to allow the tremendous stocks on hand to be used. But, the great problem confronting the industry, was to find applications for the various hydrocarbon fractions for which as yet, little use had been found. The speaker particularly urged the students present to think seriously of this important side of the subject. As an example of what might be accomplished, he instanced the replacement of Xylol as an ink solvent by a hydrocarbon product. There were many outlets for these hydrocarbons which only research would find. As yet paint solvents had not been approached, but signs pointed to the replacement of turpentine by a hydrocarbon product.

In the discussion that followed the address, some interesting points were brought out.

In reply to Professor J. B. Ferguson's query as to what work if any, had been done towards ascertaining the total vapor pressures of members of the paraffin series, Mr. Schorman stated that at the present time, this matter was having the attention of the Natural Gas Gasoline Producers' Association.

Professor J. W. Bain enquired if in the case of the Holmes-Manley still if cracking of the oil did not occur before the scraping chambers were reached, if the pressure was as high as 850 lbs. To this the speaker replied that the pressure was kept at 600-650 lbs. and as the oil was kept in the liquid phase, no cracking occurred.

Professor E. G. R. Ardagh referred to a report that some 600 million gallons of gasoline were lost yearly through evaporation from tanks, and asked if any means had been found to prevent this wastage.

In this connection, Mr. Schorman said that two schemes had been tried out. The United States Bureau of Mines had caused investigations to be made and as a result a product somewhat similar to foamite had been prepared, which, when pumped on top of the gasoline, formed a crust which hardened and prevented evaporation as long as the oil was not disturbed. It was found, however, that withdrawal of any of the oil caused the crust to crack and break, much like ice, and then evaporation occurred, though not of course as much as if the oil was completely uncovered. But what would appear to be a real solution to the difficulty had just recently been made by a young man at Chicago, who had succeeded in placing a "floating roof" on top of the oil in the tank. This roof, built much like an inverted can cover, simply floated on top of the oil. It reached within about a foot of the edge of the tank, the intervening space being covered by an asbestos sheet attached to the roof and fitting snugly all around the tank, and when oil was withdrawn the roof simply floated down with the oil. It had been proved practically one hundred per cent. evaporation-proof and had been subject to very severe tests by the inventor himself in the (not very immediate) presence of several petroleum chemists and engineers. Not satisfied with having successfully ignited all the vents in the tank, without any mishap, the inventor had climbed to the top of the tank and with a lit blow torch went all around the edge. Needless to say, had there been any evaporation, a disaster would have occurred. The floating roof had been proved beyond all doubt, evaporation-proof.

Previous to the meeting, the usual informal dinner was held. Professor A. L. Gibson of the Department of Chemistry, O.A.C., Guelph, was present and tendered an invitation on behalf of that college to the members of the Toronto Section to attend in as large numbers as possible, the meeting of the Society at the College on Friday and Saturday, November 30th to 31st. Agricultural chemistry had not, he said, received in Canada the recognition it deserved, and he felt sure that by coming to Guelph in large numbers, the Toronto members would be, not only enjoying a profitable and entertaining visit, but would be helping considerably to develop that appreciation of the place of chemistry in agriculture to which it is justly due. In his own department of dairy chemistry, there were many problems pressing for solution that many chemists little dreamed existed.

Following Professor Gibson's remarks, Professor Bain expressed the appreciation of the Section in having Professor Gibson coming personally from Guelph to give the invitation. He hoped that as many members as possible would go to Guelph. The great need of chemists was the building up of a strong professional spirit. The chemist had travelled too much alone to which fact could be attributed most of his faults.

Professor Burt-Gerrans, announced that the December meeting would take place on Friday evening, December 14th, at Hart House, at which the speaker would be Mr. Ross C. Purdy, secretary of the American Ceramic Society, who would address the Section on the "Vitrification of Clays."

Mining and Metallurgy in British Columbia

(Special correspondence to Canadian Chemistry and Metallurgy.)

Latest Metallurgical Processes Reviewed at C.I.M. and M. Meeting

Seldom, if ever, before has a meeting of the Canadian Institute of Mining and Metallurgy produced such a valuable collection of papers as the fall meeting of the British Columbia division, held at Trail in the latter part of October. The record of the proceedings will form a very accurate account of the latest metallurgical practice in the province. The most interesting feature consisted of a symposium by the various heads of departments of the Consolidated Mining & Smelting Company.

S. G. Blaylock, managing director of the company, started the proceedings with an account of the Sullivan mine from the time of its discovery by Pat Sullivan, in the early nineties, until the present time, when it ranks among first individual lead and zinc mines of the world. It was purchased by a Spokane syndicate, which shipped a considerable quantity of picked galena ore and started to erect a smelter at Marysville, but were baffled by the refractory nature of the ore, and closed the property before the smelter was finished. The Consolidated company acquired the mine in 1907, mainly on the advice of Mr. Blaylock, developed it, and in 1910 shipped 30,000 tons of ore. The rate of production to-day approaches a million tons per year, and, if demand for zinc and lead is maintained probably will markedly exceed that figure next year.

W. M. Archibald, mining engineer for the company, described the methods of mining and the precautions that are employed to safeguard the mine and the men employed in it, particularly against fire, for, it must be remembered, the ore is a dense sulphide, with only a small proportion of gangue, and spontaneous combustion is an ever-present menace, demanding constant vigilance.

E. M. Styles, designer of the Sullivan concentrator, described the plant; R. W. Diamond, superintendent of the concentrating department, described the process, and B. A. Stimmel gave an account of the hydro-electrolytic process by which the zinc is recovered from the concentrate. George Murray, assistant superintendent of the smelter, described the electrolytic refining of the lead bullion and the recovery of the precious metals therefrom.

The foregoing papers gave a pretty full account of the activities of the Consolidated company. R. L. Clapp, assistant manager for the Granby company, gave an excellent account of the geology of the Hidden Creek ore deposits, the method of mining, the production of coke and by-products, and the smelting practice in use at Anyox. He described experiments in concentration and the concentrator that is in process of construction, and he stated that it was not improbable that ultimately concentration would supersede semi-pyritic smelting at Anyox. The probability of such a procedure has been hinted by your correspondent on more than one occasion. For long semi-pyritic smelting has been one of the successful and profitable industries in British Columbia, but the increase in the cost of coal production has rung the death-knell of the industry, and for long it has been clear that it must give way to concentration, unless there is either a marked increase in the price of copper, or decrease in the price of coal. Last year the cost of coke contributed approximately two cents per pound toward the cost of copper production at Anyox.

A. C. Munro, mill superintendent for the Britannia Mining & Smelting Company, described the construction of the new mill at Britannia Beach and of the milling practice in use there. The mill has surpassed the most sanguine expectations, and during September treated 2,700 tons daily, though its rated capacity is only 2,000 tons. It is producing a far higher grade of concentrate than the old mill, the present average running twenty per cent of copper, compared with twelve to fourteen per cent. for the product of the old mill. This, of course, markedly reduces the smelting cost per pound of copper. Britannia is one of the few copper companies on the American continent that is mining copper at a profit under the existing low price of the metal. The majority are losing money.

Landslide Closes Granby Smelter

Unusually heavy rains at Anyox resulted in a landslide on November 3rd, which carried away some 200 feet of the penstock, supplying the Granby power plant, and necessitated the closing of the smelter. It is expected that the smelter will be closed for ten to fourteen days, while repairs are effected.

Indian Mines Develop Valuable Ore Shoot of Gold, Silver, Lead

Indian Mines Corporation, a large proportion of the stock of which is held in Toronto and Montreal, has driven into what gives promise of being a splendid shoot of ore in its No. 1 adit, at 810 feet from the portal. The vein is more than twenty feet wide at this point, and for some time the company has been running levels on both walls, leaving a large block of ore between. A careful sampling of the face of one level gave an assay of 0.67 ounces of gold and 120 ounces of silver per ton; the ore shows wire and flake silver freely, but contains no base metals. A two-foot band of galena ore in the face of the other level assayed 2.72 ounces of gold and 7.9 ounces of silver per ton and 17.4 per cent. of lead. A crosscut to connect the two levels has been started, and from the centre of this a raise will be put up to the surface, 268 feet away. It is expected that this work will open up a large body of shipping ore; already a large body of milling ore has been developed, and arrangements are under way for the erection of a mill next year. A diamond-drill hole, some 300 feet ahead of the face of No. 1 level, indicates fifty feet of well mineralized ore. Diamond-drilling is being done from several points, with a view to determining the size of mill that will be needed.

Pushing Developments at Georgia River

The American Mining & Milling Company, which owns the Fish Creek and Georgia River mines and the Betty group, has been developing some unusually rich gold ore in the Georgia River mine, which is situated nine miles from the mouth of Georgia River, which flows into the Portland Canal seven miles below Stewart. Apart from the richness of the ore, samples of which have run from $50 to $2,400 per ton in gold, the discovery extends the known limits of the rich ore-bearing formation. The property contains a number of veins, ranging from a few inches to five feet in thickness; some of these show gold freely, but the samples from which the assays were made showed no free gold. The company is pushing development on both of these properties, and both are likely to ship in a small way during the coming winter.

PERSONAL

Mr. G. N. Hill, F.C.I.C., formerly chemist at Imperial Varnish & Color Company, Toronto, has accepted a position as assistant manager with Messrs. Llewellyn Ryland Limited, an old established firm of varnish manufacturers at Birmingham, England.

Mr. Hill was a prominent and active member of the Canadian Institute of Chemistry and treasurer of the Toronto Branch of the Society of Chemical Industry.

The Wallaroo and Moonta Mining and Smelting Company, whose copper mines have been working since 1860, have found it necessary to apply for a winding-up order, and their position is regarded as one of the greatest industrial collapses in the history of South Australia.

World Chemical News

(Special correspondence to Canadian Chemistry and Metallurgy.)

Pure Science Well Represented at Coming British Empire Exhibition

The decision of the Association of British Chemical Manufacturers, the Royal Society, the Society of Chemical Industry, and other scientific and technical bodies collaborating with them, to organize at next year's Empire Exhibition a comprehensive exhibit dealing with pure chemical science is evidence that it is becoming fully realized in Great Britain that industries dependent upon research cannot be made to flourish by Government legislation, but can only prosper permanently in a country where chemical teaching and pure scientific research are adequate not only in quality, but also in quantity. The exhibit in question is to be divided into sections dealing with the following branches: Alkaloids, sugars, terpenes, natural coloring matter, coal-tar dyestuffs, agricultural chemistry, biochemistry, physical chemistry, inorganic chemistry, and general. Each section is in charge of one of the foremost specialists in the particular branch of science represented. Principal Irvine, for example, is organizing the sugar exhibit, Sir J. J. Russell the agricultural chemistry exhibit, and Professor Gowland Hopkins the biochemistry exhibit.

The Chemical Section occupies nearly 40,000 square feet in the Palace of Industry, and will be built in such a way as to form a Hall within the Palace. About £100,000 will be spent in presenting to the public a picture of the present state of British chemical industry. No important firm in the industry will be unrepresented, and the whole of the individual exhibits numbering about one hundred will, by reason of their position and character, combine to form a magnificent illustration of the industry.

Twenty-two Research Associations Active

According to the Report of the British Department of Scientific and Industrial Research for the year 1922-23, the number of industrial research associations which have received licenses from the Board of Trade is twenty-five, and of these twenty-two are in actual operation. Grants to associations for the financial year 1922-23 amounted to £95,345, and the balance of the Million Pound Fund remaining unexpended on March 31st, 1923 amounted to £721,505, much of which was already allocated in the form of annual payments during quinquennial periods. Only one new research association—namely, that of the flour milling industry—has been established since July, 1921, although prospective associations include adhesives, liquid fuels, pottery, paint, preserved foods, china clay, paper, drugs, mining and grinding plant.

The production of alcohol on a commercial scale for use as an ingredient of a liquid fuel for internal combustion engines has been begun in Great Britain. The Distillers' Company, Limited, has erected mixing plants at three centres, and is supplying "Discol," which is a mixture of 50% denatured spirit and 50% of a blend of hydrocarbon spirits.

Corrosion of Aluminium and its Alloys

Work on the corrosion of aluminium and its alloys has been continued under the direction of a Committee of the Institute of Metals. In spite of the difficult nature of the subject, substantial progress has been made. Attention has been mainly directed to the protection of the metal by the formation of a skin of oxide. It has been established that while this method delays corrosion under ordinary conditions, it fails under very severe conditions such as are experienced when metal is alternately wetted by sea-water and then dried. The film of oxide has strong adsorbent properties, and, by the adsorption of suitable materials which are very difficult to remove, the protective properties of the film are greatly enhanced. Trials made of samples of aluminium and certain of its alloys, protected by these means, have hitherto proved extremely satisfactory. An account of the work will be published.

Better Prospects for British Steel Industry

The third quarter of the year has been one of the worst periods in the history of the British iron and steel industry, but the last three months of the year promise to be better. Iron ore imports are on the increase, and a few more blast furnaces are being lighted. French and Belgian competitors are fully booked up, and thus British manufacturers are for the time being relieved of a good deal of difficult competition for some time.

Source of Textile Chemicals

In a recent address on the relationship between the chemical and dyeing industries, Sir Max Muspratt, Bart., of the United Alkali Co., made some interesting comments on the subject of supplies of textile chemicals. He pointed out that for acetic acid and acetates, Great Britain was almost entirely dependent upon foreign supplies, but in view of their wide distribution the position was less dangerous than it might otherwise be. Moreover, a solution was in sight in the synthetic product which would form a nucleus of future supplies. Another weak point in the British economic system was potash, which so far had only been produced in Great Britain on uneconomical lines. No anxiety need be felt over supplies of sodium chlorate or of tin and zinc salts except in the event of an almost complete blockade. The bulk of the ammonia produced is of course derived from gas works and coke ovens, but the position has been still further strengthened by the establishment of the synthetic industry by Messrs. Brunner, Mond & Co. Speaking generally, Great Britain is exceptionally strong and practically independent on the heavy chemical side and can supply the textile trade with all its requirements on reasonable terms.

Important Merger of Dyestuffs Firms in France

It is announced in Paris that an important merger of dyestuffs interests has taken place in France in the absorption by "La Compagnie Nationale des Matieres Colorantes" of the "Etablissements Kuhlmann." While no definite information is available, it seems generally admitted that this new move in the direction of a "vertical trust" has an intimate connection with the existing French occupation of the aniline and other chemical works in the Rhineland.

The combination of these two powerful concerns follows the methods adopted by the Germans themselves in their vertical trust organizations, for the Kuhlmann works are occupied in the manufacture of mineral acids which form the basis of the intermediate products serving the dye industry, and they also produce certain of these intermediate products. On the other hand, the Compagnie Nationale des Matieres Colorantes, established in 1917, represents France's effort to rid herself of dependence on the German dye industry, with the State's direct assistance. It is reponsible for 65 per cent. of the entire French output of dyestuffs, and therefore also mainly for the fact that this country is now meeting 85 per cent. of its own requirements in this line.

German Competition in Sweden Lessens

The severe competition from German manufacturers, which at one time menaced the continued existence of the Swedish engineering industry, has now begun to lessen, mainly on account of the difficulty experienced by the Germans in fixing definite terms of delivery. Since the settlement of the dispute in the iron and steel industry, Swedish ironworks have been well provided with work on accumulated orders.

Industry and Trade

Industrial Developments----Trade and Company News----Financial Notes----Patents----Market Review and Prices

INDUSTRIAL DEVELOPMENTS

WINDSOR, N.S.—The Windsor Plaster Company has purchased a new plaster quarry near Clarksville Station, and hope to be able to ship 5,000 tons per annum to their mill.

RAYMOND, ALTA. — The Utah-Idaho Sugar Company, if they are successful in securing sufficient acreage near here, intend to establish a large sugar beet factory in the immediate future.

VANCOUVER, B.C.—A group of California and Iowa capitalists have purchased a saw mill at Prince Rupert, with large timber tracts nearby, held by the Prince Rupert Holding Company, and plan to develop a pulp and paper industry. The purchase price was in the neighborhood of half a million dollars.

VANCOUVER, B.C.—Exports from this port during October included 16,000,000 feet of lumber; 87,000 shingle bundles; 10,500 bales of pulp; 125,000 cases of canned fish; 5,500 boxes of salt fish; 96,000 barrels of flour; 2,380,000 bushels of wheat; 78,000 bars lead and spelter, and 18,000 boxes of apples.

VANCOUVER, B.C.—Britannia Mill handled an average of 2,700 tons of ore per day during September. This mill is now producing a twenty per cent. copper concentrate.

MONTREAL—The Lee Puncture-Proof Tire Company of Canada, Ltd., is locating in this vicinity, where a modern manufacturing plant will be erected, having a capacity of 250 tires and 500 tubes daily. This is a branch of the Lee Tire & Rubber Company, of Conshohocken, Pa., manufacturers of puncture-proof pneumatic tires.

MONTREAL—A new company has recently been incorporated, with a capital of $10,000,000, to be known as The Steele Tremblay Paper Company, Ltd., which will carry on the business of manufacturers, dealers, importers and exporters of logs, lumber, timber, pulp and pulpwood. The head office will be located in this city, and the incorporators are: Jas. John Steele, pulp manufacturer and engineer of Montreal; Adelard Tremblay, contractor of Metabetchouan, Roberval; and George Wilbert McFarland, manufacturer of Brampton, Ont.

ST. JEROME, P.Q.—The Laurentian Timber Products Co., Ltd., have completed the construction of their wood manufacturing plant here. $20,000 worth of machinery has been installed, including a small treating cylinder for creosoting material. The pressure and vacuum process, with a pure coal-tar cresote oil, which will be used as preservative treatment, leaves the material free of tarry deposits.

KINGSVILLE, ONT.—John Ross & Co., a Canadian branch of a Liverpool firm have established a plant here for the stemming and re-drying of leaf tobacco for export purposes. Their equipment includes a Proctor & Schwartz tobacco drying machine, with a capacity of 85,000 pounds of tobacco per day.

BRAMPTON, ONT.—Early this month, the Stacey-Wagner Leather Co., Ltd., are moving here from Simcoe, Ont. They are constructing a modern plant, costing $15,000 (exclusive of equipment), and anticipate an annual output of $100,000 worth of chrome tan and mechanical leathers.

NEWCASTLE, N.B.—A branch plant of the Canada Cresoting Co., Ltd. (who already have four plants in operation, at Sydney, N.S., Trenton and Sudbury, Ont. and Winnipeg, Man.) will be erected here shortly. Wood blocks for flooring and paving, railroad ties, telegraph poles, etc., will be treated at this plant, which will be operating by the middle of next year.

DUNKIRK, SASK.—The $250,000 plant which is being constructed here by the Bishopric & Lent Co., Cincinnati, Ohio, for the manufacture of chemically pure Glauber Salts, sodium sulphate and salt cake, from the Southern Saskatchewan sodium sulphate deposits, will be in operation shortly.

The Spillers Milling and Associated Industries, Ltd., of London, England, are reported to be considering the establishment of a large flour mill in Western Canada.

CHATHAM, ONT.—An addition is being built by the Chatham Malleable and Steel Manufacturing Co., manufacturers of automobile parts and stampings.

BRAMPTON, ONT.—The Lindners, Ltd., have taken over the jam manufacturing business formerly conducted by J. L. Lindner, Ltd.

SHERBROOKE, P.Q.—The Silver Spring Brewery Co., Ltd., is increasing the capacity of their plant here to 750,000 gallons per annum.

KENTVILLE, N.S.—A small pork packing plant is probably to be established in eastern Nova Scotia.

MONTREAL — The Canadian Pacific Steamships are to build two modern and speedy passenger boats for service between Victoria, Seattle and Vancouver.

NEW WESTMINSTER, B.C.—One thousand pounds of fir seeds, extracted from British Columbia cones, have been shipped to the British Forestry Commission, London, by the Dominion Forestry Branch here.

VICTORIA, B.C.—The lumber production in British Columbia, for the first eight months of 1923 indicates a record year for the province. The increase to date is twenty per cent. over last year.

HAMILTON, ONT.—The new coke oven plant has been completed, and is equipped to manufacture three hundred tons of coke daily.

BRIDGEBURG, ONT. — The Du Pont Company, of the United States, are said to be negotiating for the purchase of a 600-acre site here, where they plan to erect a plant for the manufacture of their various products, which include powder, artificial silk, and other by-products, etc.

TORONTO—The plant of Gunn's, Ltd., Toronto, was damaged by fire last month, to the extent of $10,000.

SYDNEY, N.S.—Shipments of coal to date this season, of the British Empire Steel Corporation, have amounted to 1,436,000 tons, compared with 1,172,000 during the corresponding period in 1922. The output of the Company's coal mines is 4,363,737 tons, against 4,159,365 tons last year.

NORTHERN ONTARIO DEVELOPMENTS

A new silver vein of unusual width and richness was recently discovered at the Haileybury frontier property by Mining Corporation. This new vein, which is one of the largest ever found in the Cobalt district, is more than fifteen inches wide, and runs about ten thousand ounces of silver to the ton.

During the first nine months of this year, gold producers in Ontario received $165,003 in exchange premium. Crude gold bullion, totalling 444,205 ounces, was received at the Royal Mint, Ottawa, from Ontario.

The South Keora Mines, Ltd., have purchased the silver property in South Lorrain, formerly owned by Reilly Lorrain Syndicate, consisting of some ninety acres.

The new mill at the Gowganda Mine of the Castle-Tretheway Company, is nearing completion.

According to "The Northern Miner," a railway will probably be built from Westree to the Shining Tree Gold Camp. The C.N.R. have offered to give the T. & N. O. Railway running rights from Westree to Sudbury, if a branch from Westree to Shining Tree were built by the Ontario Government.

Pending a favorable decision from the Government the T. & N. O. Railway Commission is making a complete survey for the proposed railway branch from Cobalt to South Lorrain.

The Genesee Mining Co., Cobalt, jas produced nine tons of bagged ore from a recent discovery on the 350-foot level. The ore is from two to six inches in width, and values range from 200 to 5,000 ounces per ton. Both heavy plate silver and heavy leaf silver have been revealed in the wall rocks.

A new Cobalt Silver producer of importance is the Colonial Mine (operated by the Manago Mining Company, whose first high-grade shipment totalled slightly over ten tons, the grade running between 400 and 700 ounces to the ton. The company went down a thousand feet, through barren rock, to the lower contact of the diabase sill, to achieve this success. The former shipments of milling rock averaged thirty tons a day, but are now fifty tons a day. The ore is sent to the Cobalt reduction mill.

The Lake Shore has cut its second vein at Kirkland Lake, on the 800-foot level, and it has proved as wide and valuable in content as the gold on the 200, 400 or 600-foot levels.

The government has decided to no longer grant to Canadian gold producers the former premium on New York funds, which has lately amounted to about two per cent. This will mean a loss to Ontario gold mining companies of more than $300,000 annually, and of $500,000 to those throughout the Dominion.

The Argonaut Gold Mines expects to be milling 200 tons daily early in the new year.

The net profits for October of the Dome Mines, amounted to $230,000.

NEW CHEMICAL INDUSTRY PROPOSED FOR KINGSTON

The Dye & Chemical Company of Canada, Limited, is the name of a new company organized to manufacture organic chemicals, pharmaceuticals and dyestuffs in Canada. Arrangements are under way to establish a plant of considerable size at Kingston, Ont.

This development is important as it marks the first really serious attempt to undertake an organic chemical works in Canada. Dr. F. W. Atack, who is widely known in chemical circles in England and the dyestuffs field in the United States, is guiding the new undertaking. Associated with him are a group of directors well experienced in chemical work in Canada and in the operation of important Canadian industries. The new company is being launched under very able technical and business guidance, and for this reason its promotion should make an important forward step in Canadian chemistry.

The site for the works is on the lake shore on the inner harbor and consists of about five acres. Kingston offers rather peculiar advantages in addition to those arising from its location as a centre for distribution and the bringing in of supplies. The presence of Queen's University with established chemical laboratories, staff and library are a consideration in the location of such a plant as is proposed.

It is estimated that a works will be established at a cost of some two hundred thousand dollars for buildings and plant and a line of related chemicals, pharmaceuticals, and such dyestuffs as may be required in quantity by Canadian color users, turned out. The business of financing the undertaking is well under way and it is expected that all arrangements will be completed at an early date.

With Dr. F. W. Atack, who has had practical experience both in England and the United States in manufacturing such chemicals, directing the company, and the following board actively connected with the business, a really important industry should be established on a permanent basis in Canada considerably to the advantage of Kingston.

The board of directors is as follows:—Dr. F. W. Atack, president, Kingston, Ont.; T. H. Wardleworth, vice-president, National Drug & Chemical Company, Montreal, Que.; Dan McLachlin, Arnprior, Ont. (President McLachlin Bros., Ltd.); Dr. Arthur C. Neish, Kingston, Ont. (Queen's University); John W. Hughson, Ottawa, Ont. (Professional Engineer).

It is planned to undertake construction early in the Spring, and complete a modern factory during the building season.

CARBON BLACK TO BE MANUFACTURED IN CANADA

The Sarnia Oil & Gas Co., Ltd., will very shortly commence the manufacture of carbon black, at the plants being constructed by them at Sarnia, Ont., and at Medicine Hat, Alta. The former plant, which consists of six burning houses, engine room and block house, is equipped to produce 1,400 pounds of carbon black a day. Gasoline, as well as carbon black, is to be manufactured at Medicine Hat, where a gasoline refinery, with a daily capacity of 5,000 gallons, and a carbon plant capable of producing a thousand pounds daily, are to be built this winter.

IN THE PULP AND PAPER INDUSTRY

Erection of the huge plant of the Great Lakes Paper Co., at the western limits of Fort William, has passed the preparatory stages and actual work is under way on the foundation. With a continuation of good weather the work will be so well advanced by Christmas that it can be carried forward all winter, as is the present intention.

The most important incorporation at Quebec at the middle of last month was that of the Steele-Tremblay Paper Co., Ltd., with a capitalization of $10,000,000.

Rumors of Mergers

For some time past there have been fairly regular periodic rumors of mergers in the pulp and paper industry, which were usually centered about the mills in the St. Maurice Valley. The latest rumors have changed entirely, and the companies now mentioned are Abitibi and Spanish River. It would appear as though somebody wanted to arouse interest in the stocks whenever things get too quiet!

Vice-President Canadian P. & P.A. Warns Against Forest Depletion

In an address at the Canadian Paper Club luncheon at the Mount Royal Hotel, Montreal, on November 20th, George Carruthers, of the Interlake Tissue Mills, Toronto, urged greater co-operation between the pulp and paper men and the paper interests. He, as also vice-president of the Canadian Pulp and Paper Association, frankly told the paper men that they were using up Canadian forests much faster than the forests could produce trees, and that unless efficient co-operation for forest conservation were organized between the two interests there are inevitably bad times ahead of this great Canadian industry. His address made such a strong impression that steps are being taken to have parts of it broadcasted by radio, in pursuing the forest protection propaganda.

To Erect New Mill at Cap Rouge

It is reported that the St. Regis Pulp and Paper Co., which has important mills on the North Shore of the St. Lawrence and at various other points in the province of Quebec, is contemplating the establishment of the pulp mill at Cap Rouge, near Quebec. It is also learned that already the company has obtained from the Canadian National Railways a large area of land at a point known as the Cap Rouge pier and wharf. The cost of the mill, it is said, will reach over $4,000,000.

Large Paper Sales Agency in Liquidation

Much interest has been aroused in Canada over the news from London that the firm of Becker & Co., Ltd., has gone into the receiver's hands. As is generally known, the Saguenay Pulp and Paper Co. and some of its subsidiaries have been doing a large business with this firm, under contract. In view of the importance of the situation, Senator F. L. Beique, president of the Saguenay Pulp and Paper Co., has given out a statement on the relations of his company with the English firm. Beckers had entered into a contract whereby they were appointed sole selling agents for the Saguenay, Chicoutimi and Bay Sulphite companies for a period of ten years. When the contracts were negotiated a larger number of contracts than were accepted by the company were contemplated, and for the protection of the purchaser and the manufacturer, a committee of management was arranged, the personnel of which was to be acceptable to both Sir Frederick Becker and the Saguenay company. Owing to certain diversions between Sir Frederick and the directors of the Canadian company a termination of the contract had been under consideration for some time. The president and board of directors of the Chicoutimi Pulp Co. do not consider that the cancellation of the agency affects the contracts entered into by the company with responsible paper mills of England, and they look upon the severance of their relations with Becker & Co., Ltd., as having some advantages, among which will be the saving of the larger part of commissions, amounting to about $160,000 a year. On the other hand, Sir Frederick Becker, in a scathing indictment of the methods used by the heads of the Canadian concern, claims that they chose the time when Becker & Co. were somewhat pressed in England by the paper mills which had stood behind them to withdraw most of the ordinary credits thereby wiping out advances on preference and ordinary shares, which would thus be acquired by the Canadian interests for nothing.

Canadian Newsprint Production Increasing

The total value of the exports of pulp and paper from Canada in September amounted to $11,715,869. This was a decline of $1,579,400 from the value in August, but an increase of $1,310,436 over the value for September, 1922.

Newsprint production in October was greater than in September. Canadian mills showed a gain in output of 11.7 per cent over the previous month. The production of 114,475 tons was very close to the record high figure of 114,721 tons in August.

The total value of exports of pulp and paper in October was $12,289,952, an increase of $574,083 over the total for September, and of $1,884,519 over October 1922.

Pulpwood to the value of $1,078,000 was exported to the United States from Canada in October, a decrease in both quantity and value from the September figures, but a considerable increase over the figures for October, 1922.

Americans Do Not Expect Any Embargo

Figures compiled by the woodlands section of the American Paper and Pulp Association, showing wood under contract, on hand, and consumed in New England and New York pulp and paper mills, would indicate that the reports of larger imports of Canadian pulpwood do not truly show any effort by American mills to stock up in anticipation of a pulpwood embargo.

CATALOGS REVIEWED

Ion Concentration Measurements

The Brown Instrument Company, of Philadelphia, are putting out some new devices of special interest to chemists making ion concentration measurements. These include potentiometers, deflection meters, deflection recorders, and temperature recorders. Bulletin No. 100 announces these improvements.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Method of Making Sulphite Cooking Liquor.—G. A. Ritcher, 235423, Nov. 6, 1923. Bisulphite liquor, rich in free SO_2, is produced by passing S. burner gases through towers containing a basic material in the opposite direction to a flow of water to form a raw acid liquor with low SO_2 content, separating from the relief liquor the gases relieved during digestion, causing the relief gases to flow in counter current to the raw acid liquor to raise the free SO_2 content of the liquor, mixing the tail gas from the enriching towers with the burner gases, recovering SO_2 from the relief liquor and mixing the recovered SO_2 with the gases passed through the absorption towers at a point where the percentage SO_2 in the gas is not decreased thereby.

Cooling and Absorbing System for Sulphur Dioxide.—G. A. Richter and G. E. Wightman, 235282, Oct. 30, 1923. The hot burner gases are passed in counter-current flow in direct contact with cold water to cool the gases which are then passed through an absorbing medium, and SO_2 absorbed by the cooling water is recovered and delivered to the absorbing medium. This recovery is effected by passing the tail or unabsorbed gases through the heated cooling water. Apparatus is also specified.

Method of Making Bisulphite Cooking Liquor.—G. A. Richter, 235426, Nov. 6, 1923. Raw acid liquor is treated with recovered blow-pit gases to produce an intermediate liquor having about 3.25% free SO_2 and this is treated with SO_2 gas to produce a final liquor having a high content of free SO_2.

Recovering Waste Gases from Sulphite Liquor.—G. A. Richter, 235425, Nov. 6, 1923. Blow-pit vapors and gases are conducted in counter current flow with water through a mass of intersticial surface material, thus cooling the gases and condensing the vapors by direct contact with the water, recovering the SO_2 from the cooled gases and superheating the water to remove the SO_2 absorbed thereby. Apparatus is also specified.

Method of Making Sulphite Cooking Liquor.—G. A. Richter, 235424, Nov. 6, 1923. S. is recovered from waste liquor by separating the SO_2 from the liquor, mixing a basic material with the liquor to precipitate the combined S as monosulphite which is then separated from the rest of the liquor and converted into a bisulphite solution by reaction with SO_2 and water.

Ferrous Alloys.—E. D. Saklatwalla, 235590, Nov. 13, 1923. A ferrous alloy contains Cr. .3—1% and C to impart good tensile strength and hardness, and Cu .2—.4% to increase the ductility and dynamic strength and resistance to corrosion.

Continuous Production of Metal Sheets, Wire, Tubes, Cylinders.—S. O. Cowpercoles, 235527, Nov. 13, 1923. The cathode has imparted to it an oscillating or reciprocating motion and also a continuous or intermittent rotary motion in the electrolyte. Apparatus is specified.

Storage Batteries.—V. C. Stanley, 235448, Nov. 6, 1923.

Bleaching Cellulosic Material.—E. Ehie and G. A. Richter, 235428, Nov. 6, 1923. The material is bleached with an alkaline hypochlorite, washed and treated with an aqueous solution of Cl with the Cl in the proportion of 0.2 to 0.5% by weight of the original air-dried cellylosic material to super-bleach the latter.

Process of Making Sulphite Liquor.—G. A. Richter, 235427, Nov. 6, 1923. A sulphite solution is produced by absorption, the uncombined SO_2 is recovered from the relief liquor by passing tail gas through the liquor and this enriched tail gas is passed back to the system at a point where the gas in the system has approximately the same SO_2 content as the enriched tail gas.

Electrolytic Apparatus and Method of Depolarizing the Same.—W. D. Nickum, 235762, Nov. 20, 1923. Surfaces exposed to an electrolyte and included in an electric circuit are depolarized by causing the current variations in the circuit, due to polarization and insulating gas film formation, to induce momentary inverse and direct induced currents of relatively high tension and predetermined polarity, and applying the high tension and polarized currents to the polarized and gas film insulated surfaces to depolarize them and disrupt the gas film formation.

Thiocarbonic Acid Disluphide.—H. S. Adams, 235629, Nov. 13, 1923.

Nitration Process.—H. V. Walker, 235613, Nov. 13, 1923.

Apparatus for Producing Oxygen and Hydrogen Gases.—A. T. Stuart, 235818, Nov. 20, 1923. The apparatus consists of electrolytic cells, having insulated individual conduits leading from the positive and negative sides of the cells connected with receivers and condensers and insulated return conduits leading from the condensers to the cells. The latter conduits may be steam jacketed.

Heat Treating Electric Furnaces.—W. J. Merten, 235791, Nov. 20, 1923.

Electric Furnaces.—G. M. Little, 235789, Nov. 20, 1923. The furnace has resistor with carbonaceous terminal plates, terminal electrodes engaging the plates, and combined contact terminals and cooling means. Means are provided for introducing oil into the furnace, and means in the furnace for vaporizing the oil to reduce oxidation.

Blast Furnace Tuyers Cap for Pulverized Voal.—R. A. Wagstaff, 235785, Nov. 20, 1923.

Electrical Apparatus and Method of Depolarizing the Same.—W. D. Nickum, 235761, Nov. 20, 1923. Surfaces exposed to an electrolyte and included in an electric circuit are depolarized by causing the current variation in the circuit due to polarization to induce a current of relatively high tension and applying such current to the surfaces to be depolarized.

Manufacture of Sulphate of Lead.—J. Gitsham and H. R. Evershed, 235512, Nov. 13, 1923. Finely divided PbS is fed over and on to the arc of an electric furnace to fume the ore, the fume is withdrawn with air into a flue where it is subjected to water sprays to recover the $PbSO_4$.

Aldol from Acetaldehyde.—N. Grunstein, 235484, Nov. 20, 1923.

Removal of Chlorides from Milk.—J. Puglia, 235835, Nov. 20, 1923. One face of an osmotic member is placed in contact with milk at atmospheric pressure, the other face of the member being in contact with water. The chlorides are thus removed from the milk by osmosis. Apparatus is specified.

DEVELOPMENTS IN NEW QUEBEC GOLD FIELD

It is understood that the Rouyn Gold Mines, Limited, will spend a considerable sum in diamond drilling and exploiting the particular formation of what has been established by the Government geologists as the Pelletier Lake fault. This fault is fully one-quarter of a mile wide of highly mineralized schisted material, the gold assays from sections of which show encouraging possibilities.

Claims are being exploited by the Stabel Gold Mine Co. and by the Union Mining Co. in the township of Dubuisson, along the Harricana River, where it was reported a short time ago that rich veins had been uncovered.

Such activity is expected next season in the gold fields of Temiscamingue and Abitibi that the temporary mine record office in Villa Marie will become a permanent one, and another will be opened at Amos in the Abitibi to meet the demand for facilities to register claims.

The probability is that some important amendments to the Mining Act will be required to meet new requirements at the next session. Up to now there had practically been no need to give much attention to the development of gold mines in the Province of Quebec, their exploitation being insignificant.

Railway Extension and Road Work

It is expected that the C.P.R. will have the line from Kipawa to Riviere des Quinze completed and ready for traffic within a few weeks. The Quebec government intend constructing a winter road from the new C.P.R. terminal, at Riviere des Quinze, to the Rouyn gold fields in the Abitibi. This work was commenced on December 1st, and prospectors will soon be able to reach the mines by an all-Quebec route.

POWER DEVELOPMENT BY PRICE BROS.

Construction of a new dam and hydro electric power house on the Chicoutimi-river near Chicoutimi will be started asi soon as permission has been obtained from the Quebec government. Petition to this effect, accompanied by plans and specifications of such work, has been made by Price Bros. & Co., Ltd., of Quebec.

Work on the Kenogami Dam is reported as progressing very well, and the $2,000,000 works located at the upper part of the Saguenay River are expected to be completed within fifteen months. As a result of these works the mills operated by the Price interests will be kept in full activity during the whole year, instead of partly closing down in the winter months as they had to do in the past.

MARKETS

CHEMICALS.

Taken as a whole, while prices have for the most part remained steady, December business in chemicals has so far not measured up to the volume transacted during the first half of November. This situation is due largely to the fact that, as the end of the year approaches, buyers are keeping stocks as low as possible while they are stock-taking. Contracts for 1924 are, however, coming through very well, especially in the heavy chemicals, and this fact accounts for the steady tone to the market generally. There is still keen competition in evidence in several lines, especially in imported material, notably as between German and British chemicals.

In justice to Canadian producers of bleaching powder, we wish to correct the impression conveyed in this review last month that bleaching powder was being sold at $2.25 per cwt. in carload lots. The reference was intended for drum lots, and the error was no doubt obvious to purchasers of car lot quantities, but for those who are perhaps not familiar with the bleach market, we hasten to correct the false impression that such a wide variance existed between Canadian and American quotations. As a matter of fact, Canadian producers have not averaged $1.65 in carload lots for bleach during the past two years, and during the greater part of that time have been selling below cost of manufacture. Car lot prices in bleach are now quoted at from $1.75 to $1.85 per cwt., depending on number of cars and contract.

Arsenic quotations have eased off ½c per lb. and are quoted at 14½c for the white. Citric acid has declined 5c per lb., with a quiet market, at 45c to 50c per lb. Tannic acid, technical, is also reduced 5c per lb., present prices being 35c to 40c per lb. A firm tone prevails to yellow soda prussiate, and present quotations of 13c to 14c per lb. are not expected to remain for long, as there is a good demand prevailing and stronger prices are looked for.

The British Market.

(From our London Correspondent.)

Business in heavy chemicals has been very quiet of late, with the home trade much below normal and a moderate export trade, chiefly in the heavy alkalies. From October 1st the price of ammonia alkali was reduced by the makers by 2s. 6d. per ton, making the basis price £7 10s. per ton for spot delivery. On the other hand, the price of ammonium sulphate was raised by 2s. 6d. per ton for October delivery, making it £14 12s. 6d. per ton for the neutral quality, while for November the price was still higher at £14 15s. This is in agreement with the policy of the makers as announced some time ago, when prices for home consumption were somewhat drastically reduced. Otherwise any price changes among the heavier chemicals have been only temporary and need not be recorded.

CURRENT CANADIAN MARKET QUOTATIONS ON CHEMICALS, GUMS, OILS AND METALS.

GENERAL CHEMICALS

Acetaldehyde, 99%, carlots, 20,000 lbs. and over	lb.	.15	—
Less than carlots	lb.	.16	—
Both quotations f.o.b. Shawinigan Falls, Que.			
Acetone, pure, drums or over	lb.		— .34
Lesser amounts	lb.		— .40
ACID—			
Acetic, 28%, car. lots	100 lbs.		— 5.05
28%, 25 bbl. lots	100 lbs.		— 5.30
28%, 10 bbl. lots	100 lbs.		— 5.55
28%, 5 bbl. lots	100 lbs.		— 5.80
28%, 1 or 2 bbl. lots	100 lbs.		— 6.05
80%, carload lots	100 lbs.		—14.00
80%, 25 bbl. lots	100 lbs.		—16.00
80%, 15 bbl. lots	100 lbs.		—17.00
80%, 10 bbl. lots	100 lbs.		—17.25
80%, 5 bbl. lots	100 lbs.		—17.75
80%, 3 or 4 bbl. lots	100 lbs.		—18.75
80%, 1 or 2 bbl. lots	100 lbs.		—19.00
Glacial, bbls,	lb.		— .12
Carboys	lb.		— .12½
Boric, crystals, bbls	lb.		— .13
Boric, powder, bbls	lb.		— .12½
Benzoic	lb.	.85	— .90
Butyric, 98-99% pure, f.o.b. Shawinigan Falls	lb.	1.00	—
Citric, kegs	lb.	.45	— .50
Formic, 75%, carboys, 100 lbs.	lb.	.20	— .21
Gallic, tech.	lb.	.50	— .55
Gallic, B. P.	lb.	1.00	— 1.25
Hydrochloric, 18°, carboys, 100 lbs.	lb.	2.25	— 2.75
Hydrofluoric, 60%	lb.	.22	— .25
Hydrofluoric, 30%	lb.	.11	— .13
Lactic 44%, tech., light, bbl.	lb.		—
Lactic 22%, tech., light, bbl.	lb.		—
Muriatic, see acid hydrochloric.			
Nitric, 36°, carboys	100 lbs.	8.25	— 9.00
Oleic	lb.		— .26
Oxalic	lb.	.11	— .13
Phosphoric, 85%	lb.		— .28
Phosphoric, 50%	lb.		— .22
Pyrogallic, resublimed	lb.	2.00	— 2.10
Salicylic, tech., bbl	lb.	.47	— .48
Salicylic, B.P. bbl	lb.	.47	— .50
Sulphuric, 66°, carboys	100 lbs.	2.25	— 2.75
Sulphuric, 66°, tank cars, f.o.b. works	ton	19.00	—20.00
Stearic, double pressed	lb.	.20	— .22
Stearic, triple pressed	lb.	.23	— .24
Tannic, B.P.	lb.	.80	— .90
Tannic, tech.	lb.	.35	— .40
Tartaric, crystals, bbls	lb.	.35	— .40
Tartaric, powder, bbls	lb.	.36	— .42
ALCOHOL, absolute Ethyl, case of 1 doz.	1 lb. bottle		— 3.15
In steel drums of 10 gals. capacity	1mp. gal.		—23.00
Acetone, bbls. or over	gal.		— 1.75
Lesser amounts	gal.		— 2.00
Aldehyde Ammonia	lb.		— .75
Alum, Ammonia, lump or ground	100 lbs.	3.75	— 4.50
Aluminium Sulphate, lump bags	100 lbs.	2.25	— 2.50
Ground, bags	100 lbs.	2.50	— 2.75
Iron, free	100 lbs.		— 4.00
Ammonia, aqua, 26°, carboys	lb.	.13	— .14
Drums	lb.		— .09½
AMMONIUM, Carbonate	lb.	.12	— .15
Chloride	lb.	.10	— .13
Amyl Acetate, tech	gal.		— 4.00
Pure	lb.		— .80
Arsenic, white	lb.		— .14½
BARIUM, Sulphate, B.P.	ton		—60.00
Chloride	lb.	.06	— .08
Nitrate	lb.		— .16
Peroxide	lb.		— .26
Blanc fixe, dry, bbl	lb.		— .04¾
Pulp, bbl	ton		—
Bleaching Powd., 35%, drums. cwt.		2.50	— 3.00
Car lots, f.o.b. works	cwt.	1.75	— 1.85
Borax, crystals	lb.	.05¾	— .06
Bromine, tech	lb.		— .38
Benzaldehyde	lb.	1.35	— 1.60
Butylaldehyde	lb.	.60	—
CALCIUM ACID, Phosphate	lb.		— .07½
Carbide, ton lots, f.o.b. wks.	ton		—95.00
Carbide, less than ton lots	ton		—100.00
Chloride, fused	ton		—35.00
Chloride, flake	ton	48.00	—50.00
CAUSTIC SODA, flake, drms.	100 lbs.	5.00	— 5.50
Ground, drums	100 lbs.	5.00	— 5.50
Car lots, f.o.b. works	100 lbs.	3.55	— 3.60
Flake, car lots, 35—40c. higher per 100 lbs.			
Solid, drums	larger	4.25	— 4.75
CARBON BISULPHIDE, drums	lb.	.10	— .12
Tetrachloride, drums	lb.		— .16
Chlorine, liquid, in cylinders of 150 lbs.	lb.	.08	— .09
Cobalt Oxide, black	lb.		— 2.00
Grey	lb.		— 2.25
Copperas, crystals	lb.	.02	— .02½
Sugar	lb.	.02	— .02½
Copper Sulphate (blue vitriol)	lb.	07	— .07½
Corrosive Sublimate	lb.	1.00	— 1.50
Cyanide, Crude	lb.		— .22
Dextrine, potato	lb.		— .06
Corn	lb.		— .08½
ETHER, B.P. (conc.)	lb.		— .55
Sulphuric	lb.		— .25
Ferric Chloride, crystals	lb.	.08	— .08½
Solution	lb.		— .06
Formaldehyde, bbls. or over	lb.		— .17
200-lb. kegs	lb.		— .18½
100-lb. kegs	lb.		— .19
50-lb. kegs	lb.		— .19½
Fullers' Earth, powder	100 lbs.	2.00	— 2.50
Car lots, f.o.b. Toronto	ton		—30.00
Fusel Oil, special, refined	gal.	4.00	— 4.50
Glycerine, crude, drums	lb.		— .15
Crude, single tin of 56 lb.	lb.		— .17
C.P., single tin of 56 lbs.	lb.		— .28½
C.P., two or more tins	lb.		— .26½
C.P. drums, 500-1,000 lbs.	lb.		— .20½
Pale straw, drums, 500-1,000 lbs.	lb.		— .19½
Pale straw, single tin 56 lb.	lb.		— .27½
Pale Straw, 2 or more tins	lb.		— .25½
Hexamethylene Tetramine	lb.	.90	— .95
Hydrogen Peroxide	gal.		— .75
Iron Oxide, red, casks	lb.	.13	— .20
LEAD, Acetate	lb.	.14	— .16
Nitrate	lb.	.14	— .15
Lime, grey	ton		—14.30
Grey, in car lots	ton		—11.70
Hydrated, in ton lots	ton		—20.00
Litharge	lb.	.09	— .10
Lithopone	lb.	.06½	— .07
Magnesite, Calcined	ton		—30.00
Clinkered	ton		—35.00
Raw	ton		—10.00
MAGNESIUM, Carbonate, bbls.	lb.	.14	— .16
Sulphate, B.P.	cwt.	2.50	— 2.60
Technical, car lots	ton		—30.00
Methyl Hydrate (wood Alcohol), 95%, hbls. or over	gal.		— 1.10
95%, half-bbl. lots	gal.		— 1.30
95%, lesser amounts	gal.		— 1.35
97%, bbls	gal.		— 1.10
97%, half-bbl. lots	gal.		— 1.30
97%, lesser amounts	gal.		— 1.35
Nickel Salt, single, in bbl. lots.	lb.		— .13½
Single, per cwt	lb.		— .15
Double, barrel lots	lb.		— .14
Double, per cwt	lb.		— .15½
Phosphorus, yellow	lb.		— .34
Potash Prussiate, yellow	lb.	.33	— .36
POTASSIUM, Bicarbonate	lb.		— .19
Bichromate	lb.	.15	— .16
Carbonate, calc. 80-85%	lb.		— .14
Chlorate	lb.	.10	— .11
Citrate	lb.	.80	— .90
Hydroxide (caust. potash) sticks			— .40
Hydroxide (caustic potash), small drums	lb.	.12	— .14
Hydroxide (caustic potash) large drums	lh.	.10	— .11
Nitrate, casks	lb.	.08½	— .09
Permanganate, bulk	lb.	.19	— .20
Red Precipitate (mercuric ox.)	lb.		— 1.75
Silver Nitrate	lb.	7.50	— 8.00
Soda Ash, bags	cwt.	2.25	— 2.40
SODIUM, Acetate, ton lots or ov.	lb.		— .06
Lesser amounts	lb.		— .06½
Aluminium Phosphate	lb.		— .03½
Benzoate	lb.		— .75
Bicarbonate, 100% pure	lb.	2.50	— 3.00
Bichromate, bbls	lb.	.10	— .13
Bisulphite, powder. 60—62%	lb.	.06	— .07
Bisulphite, 35 Be	lb.	.03	— .03½
Bromide (foreign)	lb.	.20	— .22
Cyanide, bulk, 98-99%, in cases	lb.		— .34
Fluoride, 95-98%	lb.	.15	— .16
Hyposulphite, kegs	100 lbs.	4.75	— 5.00
Barrels	cwt.	4.00	— 4.50
Iodide	lb.		— 5.20
Nitrate, refined	cwt.	6.75	— 7.00
Crude, 95%	cwt.	5.25	— 5.75
Nitrite	lb.	.12	— .15
Perborate, U.S.P.	lb.	.35	— .40
Peroxide, f.o.b. New York	lb.	.25	— .27
Silicate, 42°, car lots	cwt.		— 1.35
Smaller lots	cwt.		— 1.55
Silicate, 40°, car lots	cwt.		— 1.25
smaller lots	cwt.		— 1.45
Sulphide, 60-62% fused, drums car lots	lb.	.05	— .05½
Sulphate (Glauber's Salts), crystals, in bags	cwt.	1.80	— 2.00
Car lots	cwt.	1.65	— 1.75
Sulphite	lb.		— .02
Prussiate, yellow	lb.	.13	— .14
Sulphur, ground	100 lbs.	2.50	— 2.75
Roll	100 lbs.	4.25	— 4.75
Talc, No. 1 grade	ton		—33.00
No. 2 grade	ton		—25.00
No. 3 grade	ton		—21.00
Tin Chloride, crystals	lb.	.30	— .35
Tri-Sodium Phosphate	lb.	.07	— .07½
Ultramarine, blue	lb.	.10	— .29
White Precipitate (mercuric-Ammonium chloride)	lb.	1.90	— 2.00
Whiting (English)	ton	28.00	—30.00
(American)	ton	22.00	—25.00
ZINC, Sulphate, com	lb.	.05	— .05½
Dust	lb.	.13	— .14½
Oxide, lead free	lb.	.10	— .11
Stearerate	lb.	.30	— .35

PHARMACEUTICAL CHEMICALS

AMMONIA, Aqua, C.P.	lb.		— .22
Iodide	lb.		— 6.25
Aspirin, 100 lb. lots, bulk	lb.		— .95
Caffeine, English	lb.		— 3.50
Calomel (mercurous chloride	lb.	1.30	— 1.50
Camphor, Monobromate	lb.		— 2.60
Refined, slabs	lb.		— 1.30
Refined, Tab	lb.		— 1.40
Carbolic Acid, white crystals.	lb.	.40	— .45
Chloroform	lb.	.40	— .50
Coumarin	lb.	3.75	— 4.00
Cream Tartar, 98%	lb.	.25	— .30

Ether, B.P.	lb.	—	.55
Iodine, crude	lb.	4.50 —	4.75
Resublimed	lb.	5.50 —	5.60
Lithium Carbonate	lb.	1.80 —	2.10
Potassium Bromide, crystals	lb.	.18 —	.20
Granular	lb.	.18 —	.20
Iodide	lb.	—	4.50
Phenacetin	lb.	1.75 —	2.00
Phenolphthalein	lb.	—	1.75
Quinine	oz.	.55 —	.60
Saccharin	lb.	—	1.50

SYNTHETICS

Benzyl, Acetate	lb.	—	1.75
Benzoate	lb.	—	1.75
Citral	lb.	—	4.00
Coumarine	lb.	—	3.75
Heliotropine	lb.	—	2.50
Linalyl Acetate	lb.	—	13.50
Methyl Salicylate	lb.	—	.50
Musk, Xylol	lb.	—	3.00
Teyseniol	lb.	—	1.00

ESSENTIAL OILS

Anise	lb.	—	.80
Bay	lb.	—	3.00
Bergamot	lb.	—	4.50
Cajaput	lb.	—	1.25
Camphor, white	lb.	—	.50
Brown	lb.	—	.25
Cassia	lb.	—	2.00
Cedar Leaf	lb.	1.90 —	2.00
Cedar Wood	lb.	—	.50
Citronella, Ceylon	lb.	—	.60
Java	lb.	—	.85
Clove	lh.	—	2.70
Eucalyptus	lb.	—	.65
Geranium Bourbon	lb.	—	7.50
Lavender	lb.	—	5.00
Spike	lb.	—	1.25
Lemon	lb.	—	.75
Lemongrass	lb.	—	1.35
Lime, distilled	lb.	—	1.00
Orange Sweet, Sicilian	lb.	—	3.50
West Indian	lh.	—	3.00
Peppermint, American	lb.	—	3.50
Japanese	lb.	2.50 —	2.75
Redistilled, B.P.	lb.	4.00 —	4.25
Patchouli	lb.	—	10.00
Otto of Rose	oz.	—	6.50
Rosemary	lb.	—	.65
Sandalwood	lb.	7.50 —	8.00
Sassafras	lb.	—	1.75
Thyme	lb.	—	1.45

VEGETABLE OILS

Castor Oil, No. 3, bbl.	lb.	.16½ —	.17½
No. 1, bbl.	lb.	.18 —	
Chinawood Oil	lb.	—	.27
Cocoanut, Ceylon, bbl.	lb.	—	.11
Cochin, bbl.	lb.	—	.12½
Corn Oil, bbls.	lb.	—	.12
Tank cars, f. o. b. mills		—	.10½
Cottonseed Oil, crude, f.o.b. U. S. mills, tanks	lb.	.10 —	.10½
Summer, yellow, bbl.	lb.	—	.11½
Winter, yellow, bbl.	lb.	—	.13¼
Linseed Oil, 1 to 2 bbls., Raw, per gal. of 9 lbs.		—	1.15
3 to 5 bbls., Raw, per gal. of 9 lbs.		—	1.12
6 to 9 bbls., Raw, per gal. of 9 lbs.		—	1.10
Boiled Linseed Oil, 3c. per gal. higher than raw			
Monopole Oil	lb.	.07 —	.16
Olive Oil, foots	lb.	.10 —	.11

GUMS

Arabic, clear amber sorts	lb.	—	.20
Regular grain No. 4 and No. 5	lb.	—	.28
Regular grain No. 2	lb.	—	.31
White sorts	lb.	—	.35
Powdered, No. 1	lb.	—	.40
Powdered, No. 2	lb.	—	.39
Indian, No. 1A	lb.	—	.28
No. 1	lb.	—	.25
Tragacanth, No. 1, ribbon	lb.	—	3.00
No. 1, flake	lb.	—	2.00
Turkey	lh.	—	2.00

VARNISH RESINS

Congo, sorts	lb.	.10 —	.11
Hard amber	lb.	.11½ —	.18
White	lb.	.35 —	.45
Damar, Batavia	lb.	.35 —	.38
Singapore, No. 1	lb.	.39 —	.45
Singapore, No. 2	lb.	.20 —	.24
Singapore, No. 3	lb.	.09½ —	.12
East India, pale bold	lb.	.22 —	.25
Pale nubs	lb.	.15 —	.17
Pale chips	lb.	.07 —	.12
Black bold	lb.	.09 —	.12
Black nubs and chips	lb.	.05 —	.08
Kauri, XXXXX	lb.	1.60 —	
XXXX	lb.	1.25 —	
XXX	lb.	1.10 —	
XX	lb.	.90 —	
X	lb.	.80 —	
No. 1	lb.	.67 —	.70
No. 2	lb.	.45 —	.50
No. 3	lb.	.25 —	.30
B. X	lb.	.55 —	.65
B. 2	lb.	.30 —	.35
No. 1 chips	lb.	.22 —	.27
Brown chips	lb.	.15 —	.20
Dust	lb.	.10 —	.15
Manila, Bold XXXXX	lb.	.21 —	.23
Nubs, pale	lb.	.18 —	.22
Nubs, amber	lb.	.10 —	.18
Soluble A	lb.	.16 —	.18
Soluble chips	lb.	.10 —	.12
Pontianac Bold	lb.	.20 —	.30
Genuine nubs	lb.	.14 —	.17
Genuine chips	lb.	.10 —	.13

WAXES

Bayberry	lb.	.35 —	.38
Beeswax, white, pure	lb.	—	.38
African	lb.	—	.26
Brazilian	lb.	—	.34
Chilean	lb.	—	.35
Refined	lb.	—	.31
Candelilla	lb.	.40 —	.42
Carnauba, No. 1, bags	lb.	—	.50
No. 2, North Country	lh.	—	.32
No. 3, North Country	lb.	—	.22
No. 3, chalky	lb.	—	.21
Ceresin, white	lb.	—	.12½
Yellow	lb.	—	.12
Japan	lb.	.19 —	.20
Montan, crude	lh.	.06 —	.07
Ozokerite, crude, brown	lb.	.16 —	.17
Black, 158°—160°, M.P.	lb.	.18 —	.19
Paraffin, 128°—130°, M.P., 250 lb. lots	lb.	—	.06
118°—120°, M.P., 250 lb. lots	lb.	—	.05
Parowax, blocks, 100 lb. lots	lb.	—	.08¼

SHELLAC

T.N.	lb.	—	.75
Superfine Orange	lb.	—	.80
A. C. Garnet	lb.	—	.78
Bone Dry	lb.	—	.85

NAVAL STORES, FLOTATION OILS

Pine Tar Oil, crude	gal.	—	.60
Refined	gal.	—	.65
Rosin, G., 280 lb. bbl. lots	bbl.	7.00 —	7.50
W.W., 280 lh. bbl. lots	bbl.	8.95 —	9.25
Turpentine, 1 bbl. lots	Imp. gal.	—	1.40
2 to 4 bbl. lots	Imp. gal.	—	1.38
Less than bbl. lots	Imp. gal.	—	1.45

PETROLEUM OILS AND DISTILLATES

Mid-Continent Crude, 42 W. gal.	bbl.	—	1.00
Pennsylvania Crude, 42 W. gal	bbl.	—	2.35
Coal Oil	gal.	—	.19
Fuel Oil, bbls.	gal.	—	.10.2
Tank cars	gal.	—	.08.2
Gasoline, motor	gal.	—	.23
Service stations	gal.	—	.27
Naphtha, lighting	gal.	—	.29
Naphtha	gal.	—	.23

COAL TAR PRODUCTS

Alpha—Naphthylamin	lb.	.40 —	.42
Benzol, 100%	Imp. gal.	—	.50
90%	Imp. gal.	—	.45
Carbolic Acid, crude, 25%	gal.	—	.35
Creosote Oil, crude	gal.	.35 —	.40
Refined, steel drums	gal.	—	.60
Coal Tar, crude	bbl.	—	8.75
Refined	bbl.	—	9.25
Coal Tar Pitch, bbls	cwt.	—	2.00
Cresol, U.S.P., f.o.b. N.Y.	lh.	.25 —	.30
Dip Oil, 25%, f.o.b. N.Y.	gal.	.25 —	.30
H. Acid, f.o.b N.Y, bbls	lb.	.75 —	.80
Phenol, drums	lb.	.45 —	.50
Pyridine, f.o.b. N.Y.	gal.	4.50 —	5.00
Resorcinol, tech, f.o.b. N.Y.	lh.	1.35 —	1.50
Pure, f.o.b. N.Y.	lb.	2.25 —	2.35
Naphthalin, flake	lb.	—	.09
Balls	lb.	—	.10
Solvent Naphtha, drums	gal.	.35 —	.40
Toluol, pure	gal.	—	.50
Xylene, pure, f.o.b. N.Y.	gal.	.50 —	.55
Comm., drums, f.o.b. New York	gal.	—	.34

FERTILIZER MATERIALS

Acid Phosphate	ton	$28.00 —	30.00
Animal Tankage, per unit of ammonia		—	3.50
Per unit of bone phosphate of lime		—	.10
Nitrate of Sode		70.00 —	75.00
Muriate of Potash	ton	—	40.00
Pure Ground Blood, per unit of ammonia		—	4.00
Steamed Bone Meal	ton	—	50.00
Sulphate of Ammonia	ton	68.00 —	70.00

TANNING AND DYEING MATERIAL

Chestnut Liquid Extract	lb.	.02½ —	.03½
Fustic Crystals	lb.	.24 —	.28
Ground Sumac	ton	70.00 —	75.00
Hematine Crystals	lb.	.18 —	.22
Hemlock Liquid Extract	lb.	.03½ —	.04
Liquid Sumac Extract	lb.	.06½ —	.07½
Logwood, Solid	lb.	.16 —	.19
Quebracho Liquid Extract	lb.	.03½ —	.04
Quercitron Liquid Extract	lb.	.07 —	.08

CRUDE RUBBER

The following quotations on Rubber are in American funds, New York delivery:—

Para, upriver fine	lb. $	—	.26¼
Upriver, coarse	lh.	—	.24
Caucho hall	lb.	—	.25
Plantation, 1st latex crepe	lh.	—	.27
Ribbed smoked sheets	lb.	—	.27
Brown crepe, thin, clean	lb.	—	.25½
Amber crepe, No. 1	lb.	—	.26½

MISCELLANEOUS MATERIAL

Asbestos, crude, No. 1, f.o.b. Quebec	ton	375.00 —	475.00
Shingle, f.o.b. Quebec	ton	55.00 —	60.00
Cement, f.o.b. Quebec	ton	21.00 —	25.00
Barytes, floated	ton	30.00 —	36.00
Crude, f.o.b. mines	ton	9.00 —	10.00
Casein, tech., bbls.	lb.	.28 —	.30
China Clay, f.o.b. Huberdean, Que., car lots	ton	17.00 —	18.00
Imported	ton	20.00 —	23.00
Feldspar, No. 1, f.o.b. mill	ton	—	22.00
Ferro-Silicon, 14—16%, car load lots, bulk, f.o.b. works, Welland, Ont., per gross ton of 2,240 lbs.		—	30.00
Ferro-Silicon, 50%, car load lots, bulk, f.o.b. works, Welland, with unit scale of $1.04 above or below 50% per gross ton of 2,240 lbs.		—	52.00
Ferro-Silicon, 75%, car load lots, bulk, f.o.b. works, Welland, with unit scale of $1.35 above or below 75% per gross ton of 2,240 lbs.		—	94.50

(Above prices on Ferro-Silicon do not include Canadian Government sales tax).

Firebrick, Scotch, depending on grade	M.	70.00 —	80.00
American, depending on grade	M.	75.00 —	90.00
Fluorspar, ground	ton	25.00 —	28.00
Graphite, crude high grade	ton	30.00 —	35.00
Ceylon, lump	lb.	.06 —	.06½

INDUSTRIAL GASES

Acetylene, cylinders	100 cu. ft.	$2.55 —	3.00
Coal Gas, cylinders	100 cu. ft.	3.00 —	4.00
Hydrogen, cylinders	100 cu. ft.	1.50 —	2.00
Nitrogen, cylinders	100 cu. ft.	2.00 —	3.00
Oxygen, cylinders	100 cu. ft.	1.50 —	2.00

METALS

Aluminium, 98-99%, 15 ton lots	lb.	—	.24
Antimony	lb.	.08½ —	.09
Brass, yellow ingots	lb.	—	.12
Red	lb.	—	.16½
Rods	lb.	—	.19
Cobalt	lb.	—	3.00
Copper electrolytic, small lots	cwt.	—	15.00
Car lots	cwt.	—	15.00
Casting, small lots	cwt.	—	14 50
Casting, car lots	cwt.	—	14.00
Gold, pure	oz.	23.00 —	25.00
Iron, pig	ton	—	29.30
Bar iron, base	cwt.	—	3.75
Lead, pig, small lots	cwt.	—	8.30
Car lots	cwt.	—	7.80
Magnesium, ribbon	oz.	—	1.50
Ribbon	lb.	—	18.00
Powder	oz.	.60 —	.65
Monel Metal, machined rods	lb.	—	.50
Blocks	lb.	—	.34
Shot	lb.	—	.34
Sheet, hot rolled, on orders of over 500 pounds, of one gauge	lb.	—	.48
rods, hot rolled	lb.	—	.42
Rods, cold rolled	lb.	—	.53
Nickel, shot or ingot	lb.	—	.35
Platinum, pure	oz.	—	124.00
5% iridium	oz.	—	128.00
10% iridium	oz.	—	138.00
Silver, bar, American silver	oz.	—	.99½
Bar, Canadian produced, U.S. funds	oz.	—	.64½
Steel, mild, ¼-inch, base price	cwt.	3.75 —	3.90
3/16-inch, base price	cwt.	4.25 —	4.50
Black sheet, 28 gauge, size 30"	cwt.	—	5.35
Black sheet, 28 gauge, size 36"	cwt.	—	5.60
Sheets, galvanized, 28 gauge, 30"	cwt.	—	7.75
Sheets, galvanized, 28 gauge, 36"	cwt.	—	8.00
Blue sheets, base	cwt.	4.50 —	4.60
T	lb.	—	.47
Zinc, sheets	lb.	—	.15
Zinc, (spelter), small lots	cwt.	—	8.15
Car lots	cwt.	—	7.65

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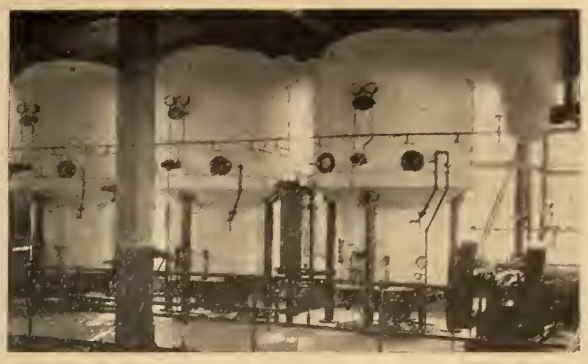

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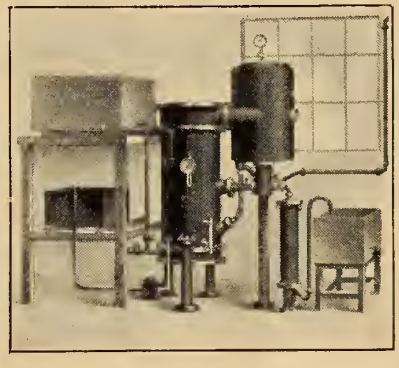

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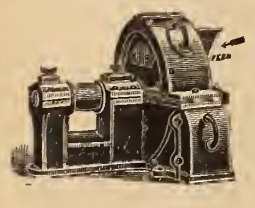

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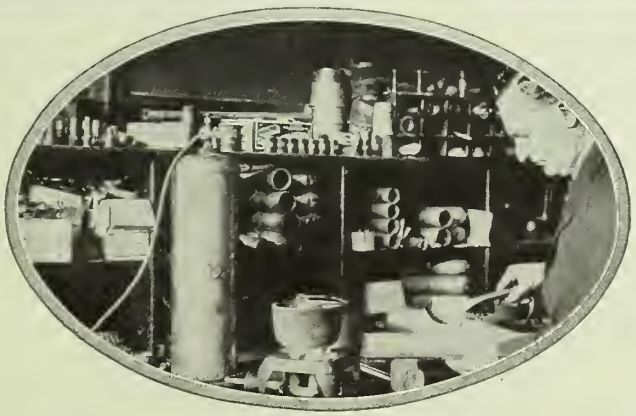

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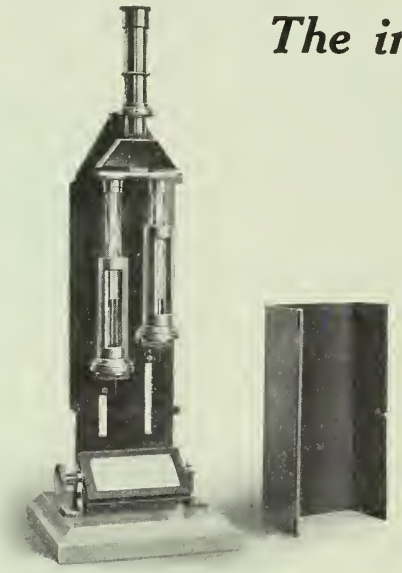

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